PRIMARY 3

MATHEMATICS

Teacher's Guide

2020/2021

Term 2

FOREWORD

This is a pivotal time in the history of the Ministry of Education and Technical Education (MOETE) in Egypt. We are embarking on the transformation of Egypt's K-12 education system starting in September 2018 with KG1, KG2 and Primary 1 continuing to be rolled out year after year until 2030. We are transforming the way in which students learn to prepare Egypt's youth to succeed in a future world that we cannot entirely imagine.

MOETE is very proud to present this new series of textbooks, Discover, with the accompanying digital learning materials that captures its vision of the transformation journey. This is the result of much consultation, much thought and a lot of work. We have drawn on the best expertise and experience from national and international organizations and education professionals to support us in translating our vision into an innovative national curriculum framework and exciting and inspiring print and digital learning materials.

The MOETE extends its deep appreciation to its own "Center for Curriculum and Instructional Materials Development" (CCIMD) and specifically, the CCIMD Director and her amazing team. MOETE is also very grateful to the minister's senior advisors and to our partners including "Discovery Education," "Nahdet Masr," "Longman Egypt," UNICEF, UNESCO, and WB, who, collectively, supported the development of Egypt's national curriculum framework. I also thank the Egyptian Faculty of Education professors who participated in reviewing the national curriculum framework. Finally, I thank each and every MOETE administrator in all MOETE sectors as well as the MOETE subject counselors who participated in the process.

This transformation of Egypt's education system would not have been possible without the significant support of Egypt's current president, His Excellency President Abdel Fattah el-Sisi. Overhauling the education system is part of the president's vision of 'rebuilding the Egyptian citizen' and it is closely coordinated with the ministries of higher education & scientific research, Culture, and Youth & Sports. Education 2.0 is only a part in a bigger national effort to propel Egypt to the ranks of developed countries and to ensure a great future to all of its citizens.

WORDS FROM THE MINISTER OF EDUCATION & TECHNICAL EDUCATION

It is my great pleasure to celebrate this extraordinary moment in the history of Egypt where we launch a new education system designed to prepare a new Egyptian citizen proud of his Egyptian, Arab and African roots - a new citizen who is innovative, a critical thinker, able to understand and accept differences, competent in knowledge and life skills, able to learn for life and able to compete globally.

Egypt chose to invest in its new generations through building a transformative and modern education system consistent with international quality benchmarks. The new education system is designed to help our children and grandchildren enjoy a better future and to propel Egypt to the ranks of advanced countries in the near future.

The fulfillment of the Egyptian dream of transformation is indeed a joint responsibility among all of us; governmental institutions, parents, civil society, private sector and media. Here, I would like to acknowledge the critical role of our beloved teachers who are the role models for our children and who are the cornerstone of the intended transformation.

I ask everyone of us to join hands towards this noble goal of transforming Egypt through education in order to restore Egyptian excellence, leadership and great civilization.

My warmest regards to our children who will begin this journey and my deepest respect and gratitude to our great teachers.

Dr. Tarek Galal Shawki
Minister of Education & Technical Education

Contents

How to Use This Guide

The Mathematics Teacher Guide is designed to support instructors in the preparation and implementation of rich and engaging learning experiences. It provides clear step-by-step instructions embedded with teacher input, instructional strategies, and classroom management techniques. In these learning experiences, students explore, play, use manipulatives, communicate and collaborate with colleagues, ask and seek answers to questions, and practice new skills and concepts.

This instructional approach aims to help students accomplish the following goals:

- Build numeracy
- Discover connections between and among math concepts
- Develop computational fluency
- Acquire and use math vocabulary
- Build awareness of measurement and geometry concepts
- Enhance critical thinking, problem solving, collaboration, and communication
- Increase enjoyment of math

If instructors have not used such a guide before, some practical advice follows:

- Read each chapter carefully in advance of instruction. Make notes and highlight important details.
- Take particular note of sections labeled Term, Chapter, or Lesson Preparation. These sections include steps the teacher will need to complete in order to implement the learning experiences in the term, chapters, and lessons. Advance preparation will ease the instructor's workload and ensure successful learning experiences for students.
- Gather the necessary materials and make any preparations before implementing the lessons.
- Consider additional classroom management techniques necessary for your particular class and learning environment.

There is a Mathematics Student Book for Primary 3. The student book contains Connect, Apply, and Math Journal pages, as well as Challenge problems (for some lessons), Student Resource pages, and (beginning in Term 2) Vocabulary pages.

Connect pages:

- Connect pages provide a space for students to record their work and thinking as they participate in the Connect activity.
- Students work independently, in pairs, in small groups, or with the whole class to develop computational fluency.
- Students work with the teacher to build connections between prior knowledge and new learning.
- Students engage in error analysis to review and reinforce previously-learned skills and concepts.
    - In error analysis, students review example work (work that was not completed by students in the class) and identify what was done correctly and what was done incorrectly. Students are then given the opportunity to solve the problem on their own. Error analysis is important because it promotes higher-level thinking and aids in conceptual understanding. It also helps students feel comfortable with checking their own work and analyzing their own errors.

Apply pages:

- Apply pages provide an opportunity for students to immediately practice the content they are learning in class.
- Students work independently, in pairs, and in small groups to explore, discover, and apply new skills and concepts.
- Students have multiple opportunities to check their work and the work of others. This kind of error analysis strengthens students' learning and deepens their understanding of mathematical concepts and connections.

- Students can extend their learning by solving Challenge problems that require them to apply skills and concepts in a new context.
- Apply pages are a wonderful resource for informally assessing student progress.
- Some pages are designed to be torn out of the book and cut apart. The backs of these pages are intentionally left blank.

Math Journal pages:

- Students reflect on their learning through drawing, writing, and completing related math activities.
- The Math Journal pages provide opportunities for students to make connections between new content and previous learning and between formal math concepts and the real world.
- Like the Apply pages, the Math Journal pages are a great resource for informally assessing student progress and gathering information about students' current understanding and potential misconceptions.

Student Resource pages:

- These pages include math tools and resources for students. Students may tear out these pages and cut, color, or use resources pages as directed by the teacher.

The information you gather from the Apply pages and the Math Journal pages can be used to plan future instruction and differentiation (see Formative Assessment, below).

Take note of the following:

- What are students discovering or learning? (Content)
- What are students' misconceptions or misunderstandings? (Remediation)
- What are students being asked to do? (Activity)
- What is the teacher discovering about students? (Assessment)
- How could you adapt the lesson for the different abilities in your class? (Differentiation)

During and after the implementation of each lesson, reflect and make notes on what was successful as well as possible suggestions for improvement.

Planning with another instructor can often lead to greater implementation success as it provides an opportunity to discuss classroom expectations, management procedures, and strategies for differentiation according to the needs of students. It is suggested that teachers meet with other instructors at least weekly to plan and reflect.

Background

Building off the success of the initial year of Education 2.0 implementation, these instructional materials support the production of engaging and rigorous learning experiences for students and teachers. In this Teacher Guide, mathematics instruction is divided into Chapters. Each Chapter includes 10 days of instruction. The teaching of mathematics and the building of numeracy is linear, with students learning new content in increments and adding to their conceptual development and understanding slowly over time.

Lesson organization
At the beginning of each lesson, the Teacher Guide provides the following:

- **Lesson Overview** provides a brief synopsis of the learning activities and learning goals of the lesson.
- **Learning Objectives** identify the student learning targets of the lesson.
- **Key Vocabulary** introduces mathematics vocabulary critical to building students' understanding of a concept.
- **Lesson Preparation** provides a general overview of preparation needed for successful implementation of the lesson. This section may direct teachers to consult Chapter Preparation for the Teacher for additional details, examples, and instructions.
- **Lesson Materials** lists all materials needed for successful implementation of the lesson.

Mathematics lessons are organized into three components:

- **Connect (10-15 minutes)**
  - During this daily routine, students build fluency in previously learned skills, make connections between prior learning and the upcoming Learn segment, and discuss mathematics concepts. Students may be introduced to an engaging, real-world math problem that establishes a purpose for learning a new skill or concept.

- **Learn (35-45 minutes)**
  - During this daily routine, students learn and apply various math skills and concepts. Students engage in exploration, experimentation, problem-solving, collaboration, and discussion to build understanding and application of new skills and concepts and make connections to prior learning. Students learn to think and work like mathematicians and persevere in developing foundational understanding of challenging skills and concepts.

- **Reflect (5-10 minutes)**
  - During this daily routine, students develop their ability to express mathematical ideas by talking about their discoveries, using math vocabulary, asking questions to make sense of learning tasks, clarifying misconceptions, and learning to see things from their peers' perspectives.

Some instructional considerations
Each section should be implemented every day. However, in some cases, students may need a few more minutes for one section and another section (or two) will have to be shortened for that day. The instructor should use personal judgment and knowledge of student needs to allocate lesson time.

Story problems and numbers are provided as examples throughout the Teacher Guide. The instructor can use the story and numbers provided or create stories to suit the needs of the students. If the numbers in a story problem or sample problem are changed, be sure to limit the quantities to those identified in the indicators and outcomes (for example, "up to 1000").

In Primary 3, students are introduced to the idea of thinking like a mathematician. As students begin to learn more complex and challenging mathematics, learning and practicing these skills and behaviors will help them become thoughtful, responsible learners. The instructor is advised to create a "Thinking Like a Mathematician" anchor chart (as shown below) to display throughout the year.

THINKING LIKE A MATHEMATICIAN
Mathematicians: • Persevere to solve challenging problems • Work hard to make sense of problems • Explain their thinking and try to understand the thinking of others • Support their mathematical arguments with words, numbers, and/or pictures • Use models to solve problems • Select and use appropriate tools • Use what they know about mathematics to solve problems

There are references to the "Thinking Like a Mathematician" skills and behaviors throughout the lessons. However, it is recommended that the instructor refer students to the anchor chart during instruction whenever possible and helpful, whether or not it is noted in the Teacher Guide.

The instructor is encouraged to incorporate familiar counting songs, poems, rhymes, math stories/literature, and math games and activities that are not included in this Teacher Guide.

Learn more about Education 2.0

Changes in Term 2

Vocabulary pages:

- Beginning in Term 2, students collaborate to develop definitions for math terms and record those terms and definitions in their Student Book. This helps students build understanding of critical vocabulary and take ownership of their learning.
- Multiple opportunities are provided in the lessons for students to develop and record math terms and definitions. However, you may choose to have students record additional vocabulary based on their learning needs.

Essential Questions:
Beginning in Term 2, students are introduced to Essential Questions. Essential Questions help students learn that questioning is an important part of learning. The instructor can model what types of questions they should be asking themselves as they learn new skills and concepts. When students learn how to ask questions of their own, their learning becomes more meaningful. Essential Questions also help students think about their own thinking (metacognition).

In lessons that do not have an Essential Question, instructors are encouraged to develop one of their own. It is important to know that good Essential Questions:

- Can be open-ended
- Should be thought provoking
- Require higher order thinking
- Point toward big ideas that students can transfer to other learning
- Raise additional questions
- Require justification
- Can recur over time

Sample Essential Questions:
- When and why should we estimate?
- What patterns can we observe?
- How does what we measure affect how we measure?
- How can we use what we know about fractions to solve these kinds of problems?

Instructional Strategies

Many of the instructional strategies described below are woven throughout the Teacher Guide. These are not meant to be the only methods used in the classroom; rather they are highlighted as best practices for engaging students in active, inquiry-based learning. As teachers and students gain familiarity with the strategies, instructors may wish to modify and personalize to suit the needs of each individual classroom.

For more strategies visit: tinyurl.com/Edu2-0strategies

INSTRUCTIONAL STRATEGY NAME	BRIEF DESCRIPTION
2 Stars and a Wish	This strategy is used to help students give positive feedback to peers. Two stars are two things the student likes about the work that is being evaluated. One wish is a suggestion to improve upon that work.
Ask 3 Before Me	Students ask three peers for assistance before asking the teacher. This strategy is used when students are working collaboratively to develop communication skills, encourage peer interactions, and decrease reliance on the teacher's support in large classrooms.
Attention Getting Signal	The teacher uses an explicit signal to get the attention of the class when they are talking in pairs or working in groups. There are many options for signals, and more than one can be used as long as students recognize it. Options include a clap pattern that students repeat, a simple call and response phrase, or a hand in the air (see: Hands Up). This strategy allows teachers to ask for students' attention without shouting or immediately disrupting student conversations.
Brainstorm	Students provide multiple answers for an open-ended question. This can be done as a whole class or in groups or pairs. The purpose of a brainstorm is to list many answers, not to critique whether answers are realistic, feasible, or correct. Once an initial broad list is made, students can go back to answers to prioritize or eliminate some options. This strategy promotes creativity and problem-solving.
Calling Sticks	Teacher writes the names of students on popsicle sticks and places them in a can/jar. To call randomly on students, the teacher pulls a stick from the jar. After calling on the student, the teacher places that stick into another can/jar so that student is not immediately called on again. This strategy helps teachers call on a wide variety of students and encourages all students to be ready with an answer.
Count Off	Teacher breaks students into groups by having students count off to a certain number. It is important to tell students to remember their number. For example, if the teacher wants three groups, the first student counts one, the next student says two, the next say three, and the next student starts over at one, and so on. When all students have counted, tell all the number ones to meet together, all the number twos, and then all the number threes. This strategy enables time-efficient grouping and reinforces conceptual number use.
Fishbowl	Students gather around a teacher or group of students who are modeling something new. The students observe carefully as if they are watching fish in a bowl. This strategy promotes the full attention of students even when individual students are not actively participating in the demonstration.

INSTRUCTIONAL STRATEGY NAME	BRIEF DESCRIPTION
Four Corners	Each of the four corners of the room corresponds to a possible opinion about a thought-provoking statement. The teacher may post a picture or a prompt in each corner of the room to represent the opinions/statements. Students walk to the corner that interests them or expresses their opinion to group with other like-minded students. This strategy allows students to express opinions and to prepare justifications with others who agree before presenting to the class.
Gallery Walk	As if in a museum, students walk past displays and respond to questions or prompts about the display. This strategy can be used in multiple ways, including to consider ideas posted on chart paper around the room or to view classmates' final products. This strategy encourages diversity of thought. When used at the end of a project, this strategy allows students to celebrate and take pride in their work while also honoring and responding to others' work.
Hands Up	The teacher holds a hand in the air to signal that students should stop what they are doing, stop talking, and look up at the teacher. When students notice the teacher's hand up, they also raise a hand to signal to classmates. This strategy is used as an attention-getting signal.
Hands Up Pair Up	Students stand and walk around the room quietly with one hand raised in the air. The teacher says, "Stop—Pair Up." Students clap hands and stand together with a nearby student. Anyone with a hand still up needs as a partner. Students can easily find each other and pair up.
I Do, We Do, You Do	I Do: Teacher demonstrates or models an action to take place, such as reading a passage to the students. We Do: Students repeat the action with the teacher, such as re-reading a passage in unison. You Do: Student practices the learned action without the guidance of the teacher. This strategy supports students by modeling an expectation, allowing for low-pressure practice, then providing opportunities for independent practice.
I See Very Clearly	The teacher tells students he/she sees something. Students guess what it is as the teacher gives students clues. Students use observation and listening skills to guess the correct object. This strategy emphasizes the use and identification of object properties and characteristics.
Imagine That	The teacher describes a person, animal, plant, or situation for students to act out. Students imagine that they are the living thing or are in the situation and act out what happens. This can also be done in groups with a student, or rotating students, acting as the leader. This strategy promotes imagination and long-term memory. (See also: Charades to add a guessing element.)
Jigsaw	Students are divided into small “home” groups (for example, groups A, B, C, D, and E). The teacher provides different instruction (or instructional materials) to each “home” group so that each group becomes the “expert” in their unique skill or strategy. For example, there is a group of A experts, B experts, C experts, and so on. The teacher then carefully regroups students so that each new small group has at least one member of each “home” group. For example, each new group will now have one A, one B, one C, and so on. Student experts teach each other what they have learned. This strategy helps students develop ownership of their own learning, confirm their understanding, and build confidence in their mathematical abilities.
Lean and Whisper	Students lean one shoulder in toward one neighbor to answer a question that has a one- or two-word (or short) answer. This strategy engages all students in answering a question without disrupting the flow of the classroom.

INSTRUCTIONAL STRATEGY NAME	BRIEF DESCRIPTION
Model	The teacher or student demonstrates exactly how to complete a task. The rest of the class can ask questions before repeating what was demonstrated. This strategy allows the teacher to review any safety concerns or difficult aspects of a task, as well as share advice for task completion. This method should not be used for some inquiry activities, as it could over-influence the direction of student thinking.
Number Sign	The teacher can check for understanding quickly by asking a question and giving students a choice of answers. Students hold up one, two, or three fingers in response to the question asked. The teacher quickly scans the fingers raised to get a sense of how many students are tracking the material.
Numbered Heads Together	This is a cooperative strategy that holds each member of a group accountable for learning/discussing material. Each student in the group is given a number. The teacher poses a question to the group. Students put their heads together to discuss the answer. The teacher then calls a number to identify a "spokesperson" to share the group's answer.
On the Fence	Each of the two sides of the room corresponds to a possible opinion about a thought-provoking statement. The teacher may post a picture or a prompt on each side of the room to represent the opinions/statements. Students walk to the side that interests them or expresses their opinion to group with other like-minded students. Students may also stay "on the fence" in the middle of the room if they are undecided. Students debate their opinion with evidence to persuade others in the room to agree with them. As students change their minds, they move to the corresponding area in the room.
One Stay One Stray	After working with partners, one person stays with the work product to present to other students while the second partner walks around and listens to peers in the class share. Then the two students switch roles. Using the strategy, both partners get to share their project and listen to others share.
Pass the Pen	Students work collaboratively in a group with one pen or pencil per group. The teacher poses a question or topic to groups. One student writes down an idea or answer, then passes the pen to the next group member. The pen continues to be passed around, allowing all students an opportunity to write at least once or twice. The strategy is used to brainstorm or activate prior knowledge on a topic and is helpful for encouraging all students to participate and share ideas.
Popcorn	Call on one student to answer a question. After the student has answered the question, they say "popcorn" and say the name of another student. It is now the turn of that student to answer the question, then pick a new student, and so on. If a student has responded, they should not be called upon a second time during the same **Popcorn** activity.
Relay Race	Divide the class into teams and have them line up single file. Call one student from each team to the front of the class. Ask students a question and the first to answer receives a point for their team. After answering, the student goes to the end of the line and the next student goes to the front of the room. A variation for math problems is for students to complete only one part of a math problem at a time.
Shake It Share It High Five	Students move around the classroom until the teacher signals to stop. Students then partner with a nearby student. Partners shake hands, share ideas or work products, then high five before moving around again to find a new partner. This strategy gets students out of their seats and moving, while also allowing them to share with classmates they do not sit near.
Shoulder Partners	Students lean and talk quietly with the person sitting next to them. **Shoulder Partner** can be used literally to just talk to the people sitting on either side, or it can be used for slightly larger groups of three or four with everyone's shoulders "touching." (This promotes the ability to speak softly—in sort of a huddle).

INSTRUCTIONAL STRATEGY NAME	BRIEF DESCRIPTION
Snowball Fight	Students respond to a prompt using a half sheet of paper. The student crumples the paper up like a snowball and tosses it across the room. Students pick up a snowball that lands close to them, add their comment or answer, and crumple to toss again. Repeat as needed. The strategy encourages students to interact with the ideas of students who do not sit nearby in an anonymous manner.
Think Aloud	The teacher models a process of thinking by speaking aloud what is thought. As an example, "I think I need more color here in my drawing." This strategy models for students the type of thinking they can use in an upcoming activity.
Think Time	Teacher allows a distinct period of silence so that students can process tasks, feelings, and responses. Allow students 15 to 30 seconds to think to themselves before calling on anyone to provide an answer to the class. This strategy is particularly helpful for shy or quiet students, as well as students who prefer to process content individually before contributing to a classroom or group conversation.
Thumbs Up	The teacher can quickly check for understanding using this strategy. Students hold thumbs up for agreement and thumbs down for disagreement to a question asked by the teacher. Thumbs up can also be used as a way for students to signal to a teacher that they are ready for an instruction. Thumbs down should never be used to denote disagreement with a student's answer or idea.
Turn and Talk	Students turn "knee to knee" and "eye to eye" with a **Shoulder Partner** to discuss answers to long-form questions. This strategy allows students to discuss ideas, reflect on learning, and check each other's answers.
Venn Diagram	Teacher draws two or more large overlapping circles as a graphic organizer to show what is the same and different about multiple topics. Teacher notes similarities in the overlapping section of the circles, then summarizes differences in the respective parts of the circles that do not overlap. This strategy allows students to visually see and record similarities and differences.
Wait Time	Similar to the **Think Time** strategy, the teacher waits at least seven seconds after asking a question to the whole class or after calling on a student to respond. This provides time for students to think independently before an answer is given out loud.
Whisper	The teacher can provide whole class verbal processing time by allowing students to respond to a question by whispering the answer into their hands. This strategy prompts every student to attempt an answer, with no social-emotional recourse if their answer is wrong.
Zoo Can	Similar to **Calling Sticks**, the teacher pulls a name stick from the can and the students must count backward while acting like an animal. This can be used for relevant content instruction or as a quick break when students need to move and laugh before finishing a task or moving on to a new task.

Formative Assessment

What is formative assessment?

The term assessment often brings to mind exams. Exams can be effective at summarizing learning at the end of a chapter, unit, instructional period or school year. After a student learns material for a certain amount of time, an exam measures how much the student has learned, retained, and can apply. **Formative assessment** encompasses strategies used in the classroom to find out if and how much students are learning along the way, so that instruction can be adjusted.

Why embed formative assessment in instruction?

Formative assessment is a tool that supports responsive teaching. Embedding formative assessment provides instructors with evidence about how much students are learning, retaining, and applying. A teacher who frequently seeks and receives feedback about how much progress students are making toward learning goals can adjust instruction to respond to misconceptions, misunderstandings, and gaps in students' ability to apply learning.

How does embedding formative assessment improve learning?

The following table (Wiliam, 2011) provides an overview of five strategies that instructors, peers, and students can use to give and receive evidence of learning throughout the learning process.

<table>
<tr><th></th><th>WHERE THE LEARNING IS GOING</th><th>WHERE THE LEARNER IS RIGHT NOW</th><th>HOW TO GET THERE</th></tr>
<tr><td>TEACHER</td><td rowspan="3">Clarifying, sharing, and understanding what we intend for students to learn and the criteria for success</td><td>Eliciting evidence of learning</td><td>Providing feedback that moves learning forward</td></tr>
<tr><td>PEERS</td><td colspan="2">Activating learners as instructional resources for one another</td></tr>
<tr><td>LEARNER</td><td colspan="2">Activating learners as owners of their own learning</td></tr>
</table>

Wiliam, Dylan. Embedded Formative Assessment. Bloomington: Solution Tree Press, 2011.

The first essential step is to identify (and share with students) the desired learning outcomes, or "where the learning is going." Once learning goals are established, teachers, peers, and students themselves can check in on "where the learner is right now," or how much progress is being made toward the goals. Rather than assessing whether or not a student has sufficiently learned content after the fact, formative assessment practices provide feedback so that teaching and learning ("how to get there") can be adjusted to better obtain the agreed-upon goals.

What does embedding formative assessment look like in the classroom?

Formative assessment often occurs through classroom discussions and tasks that ask students to explain and justify their thinking. If individual students struggle to understand or apply a concept, a teacher can differentiate instruction or provide peer support to meet that students' needs. Instructors can also gather information about student learning during instruction. For example, by walking around the classroom and checking students' work as they practice new learning on Apply pages in their Mathematics Student Book, teachers can learn a great deal very quickly about students' understanding and misconceptions. When many students exhibit evidence of misunderstanding or gaps in knowledge or skills, a teacher can decide to review, reteach, or present a new approach to achieving the learning goals.

Primary 3 Term 2 Mathematics Scope and Sequence

PRIMARY 3	THEME 3	THEME 4
A. COUNTING AND CARDINALITY		
Instruction of Counting and Cardinality is completed by the end of Primary 1.		
B. OPERATIONS AND ALGEBRAIC THINKING		
1. Represent and solve problems involving multiplication and division.	**X**	**X**
a. Explain products of whole numbers. 1) For example, describe or represent 2 × 3 as the total number of objects in 2 groups of 3 objects each.	X	X
b. Explain quotients of whole numbers. 1) For example, describe or represent 24 ÷ 4 as the number of objects in each share when 24 objects are divided equally into 4 shares 2) For example, describe or represent 24 ÷ 4 as a number of shares when 24 objects are partitioned into equal shares of 4 objects each. 3) For example, describe a context in which a number of shares or a number of groups can be expressed as 24 ÷ 4.	X	X
c. Multiply and divide within 100.	X	X
d. Use strategies to solve problems multiplication and division problems, including: 1) Manipulatives 2) Drawings 3) Arrays 4) The relationship between multiplication and division	X	X
e. Know from memory all products of two one-digit numbers by the end of Primary 3.		X
2. Understand properties of multiplication and the relationship between multiplication and division. Solve problems involving the four operations.	**X**	**X**
a. Apply properties of operations as strategies to multiply and divide, including: 1) Commutative Property of Multiplication If 4 × 3 = 12 is known, then 3 × 4 = 12 is also known. 2) Associative Property of Multiplication The problem 5 × 2 × 4 can be solved by multiplying any two of the numbers, then multiplying the product by the third number. 3) Distributive Property of Multiplication The problem 8 × 6 can be solved as 8 × 4 + 8 × 2. The problem 3 × (4 + 2) can be solved as 3 × 4 + 3 × 2.	X	X
b. Apply the relationship between multiplication and division to solve multiplication and division problems with one unknown.	X	X
c. Solve two-step story problems involving addition, subtraction, multiplication, or division.	X	X
d. Use mental computation and estimation strategies (including rounding to the nearest 1,000) to assess the reasonableness of answers.	X	Apply throughout year

PRIMARY 3	THEME 3	THEME 4
C. NUMBERS AND OPERATIONS IN BASE TEN		
1. Work with numbers to gain foundations for place value.	**X**	**X**
a. Read numbers to 100,000 using numerals, word form, and expanded form.	X	Apply throughout year
c. Identify arithmetic patterns, including those in addition and multiplication fact families.	X	X
2. Use place value understanding and properties of operations to add and subtract multi-digit numbers.	**X**	
a. Add and subtract two numbers up to four digits using a variety of strategies, such as: 1) Place value concepts and regrouping. 2) Properties of operations. 3) Relationship between addition and subtraction.	X	
b. Multiply one-digit whole numbers by multiples of 10 in the range 10 to 90 (for example, 3 × 50, 6 × 30) using strategies based on place value and properties of operations.	X	
3. Develop an understanding of fractions as numbers.		
a. Describe a proper fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts.	X	X
b. Read and write proper fractions.	X	X
c. Identify and represent fractions on a number line. 1) Represent a fraction 1/b on a number line by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts; demonstrate understanding that each part has size 1/b. 2) Represent a proper fraction a/b on a number line.	X	X
d. Demonstrate understanding that two fractions are equivalent (equal) if they are the same size or at the same point on a number line.	X	X
e. Demonstrate understanding that the proper fraction b/b is equal to one whole.	X	X
f. Identify and generate simple equivalent fractions.	X	X
g. Explain why the fractions are equivalent verbally or by using fraction models.	X	X
h. Demonstrate understanding that comparisons of fractions are valid only if the wholes are the same.	X	X
i. Compare two fractions with the same numerator or the same denominator by reasoning about their size using a number line or concrete models.	X	X
j. Use the symbols >, =, or < to record the results of fraction comparisons.	X	X
k. Use concrete models to add and subtract fractions with common denominators.	X	X

PRIMARY 3	THEME 3	THEME 4
D. MEASUREMENT AND DATA		
1. Measure and estimate length and mass in metric units. Estimate and read volume in metric units.	**X**	**X**
a. Select appropriate tools and measure objects in millimeters, centimeters, or meters. 1) Estimate and measure lengths using millimeters, centimeters, and meters. 2) Use place value concepts to convert between millimeters and centimeters and centimeters and meters.	Apply throughout year	
b. Select appropriate tools and measure objects in grams and kilograms. 1) Estimate and measure masses of objects in grams and kilograms. 2) Use place value concepts to convert between grams and kilograms.	Apply throughout year	
2. Solve problems involving measurement and estimation of length, mass, and time.		
a. Solve one- and two-step story problems involving length, mass, and time.	Apply throughout year	
3. Work with time and money.		
a. Tell and write exact time from analog and digital clocks.	Apply throughout year	
4. Represent and interpret data.		
a. Collect, organize, and represent numerical data on a line plot.	Apply throughout year	
b. Solve story problems and analyze data displayed on a line plot. *Note: Students may continue to analyze data from bar graphs and pictographs.*	Apply throughout year	
5. Understand concepts of area and relate area to multiplication and to addition. Recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.	**X**	**X**
a. Relate area to the operations of multiplication and repeated addition: 1) Find the area of a rectangle with x square units. 2) Find the area of a rectangle with whole-number side lengths using concrete models. 3) Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems.	X	X
f. Solve real-world and mathematical problems involving perimeters of polygons, including: 1) Finding the perimeter given the side lengths. 2) Drawing rectangles on a grid with the same perimeter and different areas or with the same area and different perimeters.	X	
E. GEOMETRY		
1. Identify and describe shapes; reason with shapes and their attributes.		
a. Identify rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.	X	

Grade (P3)Class: _____ Date: _____ Present: _____ Absent: _____ Students' total number: _____

Content / Windows	Theme	Chapter	Lesson	Learning Objectives	Activities	Teacher's Choices						
						Teacher guide Pages	Teaching strategies	Questions/ Modeling	Digital esources	Differentiation / Challenges	Maths Journal	Enrichment

Teacher's Self Reflection	☐	Exceeds expectations	☐	Meets expectations	☐	Sometimes Meets Expectations	☐	Below Expectations	☐

Grade (P3)Class: _____ Date: _____ Present: _____ Absent: _____ Students' total number: _____

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Teacher's Self Reflection	☐	Exceeds expectations	☐	Meets expectations	☐	Sometimes Meets Expectations	☐	Below Expectations	☐

PRIMARY 3

Mathematics

HOW THE WORLD WORKS

ORIGINS

Chapter 1

Lessons 61 to 70

Chapter 1: Lessons 61 to 70

Chapter Overview:

In the first chapter of Theme 3, students strengthen skills in computation and problem-solving. In this chapter, students focus on multiplication, as this is one of the most important concepts for students to explore in Primary 3. They work with numbers in context and by themselves as they apply what they have already learned about patterns and strategies. They hone in on the properties of multiplication, including Associative, Commutative, and Distributive. Students estimate to determine the reasonableness of answers and learn how to solve problems with an unknown number, which is an introductory algebraic concept. They solve multiplication and perimeter problems using a symbol to represent the unknown quantity.

In this second half of Primary 3, Essential Questions and Math Vocabulary are introduced. Essential Questions are questions that guide student learning and require nuanced considerations to answer. Essential Questions are posed at the beginning of some lessons and may take more than one lesson to cover. Students return to answer them once relevant skills and concepts have been taught. Math Vocabulary includes key terminology that all students need to define and use. Students write definitions in the back of the Mathematics Student Books as a glossary. During class, writing these definitions is scaffolded, where teachers write them, and students copy at first. Eventually, students will write original definitions for key terminology. This helps students internalize the meaning of important vocabulary words and take greater ownership of their learning.

COMPONENT	DESCRIPTION	LESSONS
Connect	During this daily routine, students build fluency in previously learned skills, make connections between prior learning and the upcoming Learn segment, and discuss mathematics concepts. Students may be introduced to an engaging, real-world math problem that establishes a purpose for learning a new skill or concept.	10 to 15 minutes
Learn	During this daily routine, students learn and apply various math skills and concepts. Students engage in exploration, experimentation, problem-solving, collaboration, and discussion to build understanding and application of new skills and concepts and make connections to prior learning. Students learn to think and work like mathematicians and persevere in developing foundational understanding of challenging skills and concepts.	35 to 45 minutes
Reflect	During this daily routine, students develop the ability to express mathematical ideas by talking about discoveries, using math vocabulary, asking questions to make sense of learning tasks, clarifying misconceptions, and learning to see things from peers' perspectives.	5 to 10 minutes

Learning Indicators

Throughout Lessons 61 to 70, students will work toward the following learning indicators:

B. OPERATIONS AND ALGEBRAIC THINKING:

1.c. Multiply and divide within 100.

1.d. Use strategies to solve multiplication and division problems, including:

1) Manipulatives
2) Drawings
3) Arrays
4) The relationship between multiplication and division

2.a. Apply properties of operations as strategies to multiply and divide, including:

1) Commutative Property of Multiplication
   - If $4 \times 3 = 12$ is known, then $3 \times 4 = 12$ is also known.
2) Associative Property of Multiplication
   - The problem $5 \times 2 \times 4$ can be solved by multiplying any two of the numbers, then multiplying the product by the third number.
3) Distributive Property of Multiplication
   - The problem $3 \times (4 + 2)$ can be solved as $3 \times 4 + 3 \times 2$.

2.b. Apply the relationship between multiplication and division to solve multiplication and division problems with one unknown.

2.c. Solve two-step story problems involving addition, subtraction, multiplication, or division.

2.d. Use mental computation and estimation strategies (including rounding to the nearest 1,000) to assess the reasonableness of answers.

C. NUMBERS AND OPERATIONS IN BASE TEN:

1.c. Identify arithmetic patterns, including those in addition and multiplication fact families.

D. MEASUREMENT AND DATA:

5.f. Solve real-world and mathematical problems involving perimeters of polygons, including:

1) Finding the perimeter given the side lengths.

CH 1 Pacing Guide

LESSON	INSTRUCTIONAL FOCUS
61	Students will: • Explain the Associative Property of Multiplication. • Apply the Associative Property of Multiplication to solve problems. • Collaborate to define math terminology in their own words.
62	Students will: • Explain the Distributive Property of Multiplication. • Apply the Distributive Property of Multiplication to solve problems. • Collaborate to define math terminology in their own words.
63	Students will: • Apply strategies to estimate products. • Apply properties and strategies to solve multiplication problems. • Explain chosen problem-solving strategies.
64	Students will: • Tell time to the minute. • Explain the relationship between multiplication and division. • Solve multiplication and division problems with an unknown number. • Explain how they can use the relationship between multiplication and division to solve problems.
65	Students will: • Identify a variety of multiplication and division problem-solving strategies. • Apply more than one strategy to solve multiplication and division problems with an unknown number. • Justify the use of preferred problem-solving strategies.
66	Students will: • Solve perimeter problems involving an unknown side length.
67	Students will: • Solve two-step story problems involving addition, subtraction, multiplication, or division. • Explain the strategies they use to solve complex story problems.
68	Students will: • Analyze solutions to two-step story problems to identify and explain the errors made. • Explain the benefits of error analysis in improving thinking and learning.
69	Students will: • Apply multiple strategies to solve two-step story problems. • Justify problem-solving strategies.
70	Students will: • Write two-step story problems involving any operation. • Solve two-step story problems.

Chapter Preparation for Teacher

For Lesson 61:

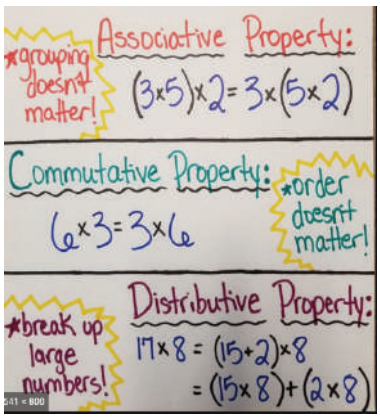
- Gather number cards 0 to 6 or one six-sided die for each student. See the Number Cards 0–12 Blackline Master, if needed.

For Lesson 64:

- If a teaching clock is not available (or if you have not already made a teaching clock), create one using the Analog Clock Face–Large Blackline Master.

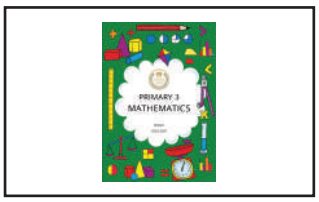
For Lesson 65:

- Create a large anchor chart labeled **Multiplication and Division Strategies**. You will add strategies to the chart during the lesson.
- Create another large anchor chart labeled **Properties of Multiplication**. Add the Associative, Commutative, and Distributive properties. Include a very brief description and an example. Sample shown below.



Materials Used

Student book



Pencil

Colored pencils or markers

Teaching clock or large hand-made clock

Number cards 0 to 6 or six-sided dice

Anchor charts

Properties of Multiplication anchor chart

Multiplication and Division Strategies anchor chart

Strategies anchor chart

Lesson 61 Overview

LESSON OVERVIEW

In this lesson, students begin with an error analysis problem related to area and perimeter. They review how to determine area and discuss why it is important that square tiles that cover a shape are of equal size and do not overlap. In Learn, students explore the Associative Property of Multiplication and apply it to solve multiplication problems. Learning the properties of multiplication is important because it helps students build number sense and efficiently solve problems. The properties are useful because they can help students identify and use structures and patterns with numbers. In Reflect, students begin to use the Math Vocabulary section in the back of the student books. The class will work to define Associative Property of Multiplication. The teacher will then write an agreed-upon definition on the board for students to copy. This process helps prepare students for developing definitions for math vocabulary in their own words.

LEARNING OBJECTIVES

Students will:

- Explain the Associative Property of Multiplication.
- Apply the Associative Property of Multiplication to solve problems.
- Collaborate to define math terminology in their own words.

LESSON PREPARATION FOR THE TEACHER

- Gather number cards 0 to 6 or six-sided dice (one per student).

KEY VOCABULARY

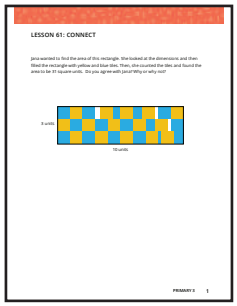
- Associative Property of Multiplication
- Factors
- Parentheses
- Product
- Property

MATERIALS

- Number cards 0 to 6 or six-sided dice (one per student)
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 61: CONNECT

Jana wanted to find the area of this rectangle. She looked at the dimensions and then filled the rectangle with yellow and blue tiles. Then, she counted the tiles and found the area to be 31 square units. Do you agree with Jana? Why or why not?

3 units

10 units

PRIMARY 6 1

1. TEACHER DO: Ask students to share what they know about area and perimeter, including the differences between the two. If needed, clear up misconceptions and fill in gaps in knowledge.

TEACHER SAY: Please open your Mathematics Student Book to page Lesson 61: Connect. Raise your hand if you would like to read the problem to the class.

STUDENTS DO: Raise hand to volunteer. Selected students read aloud.

Jana wanted to find the area of this rectangle. She looked at the dimensions and then filled the rectangle with red and blue tiles. Then, she counted the tiles and found the area to be 31 square units. Do you agree with Jana? Why or why not?

TEACHER SAY: Turn to your Shoulder Partner and discuss if you agree with Jana's area measurement or not. If you disagree, discuss what she may have done wrong.

STUDENTS DO: Talk to partner about Jana's solution.

TEACHER DO: Give students 1 minute and then use **Calling Sticks** to select one or two students to explain Jana's error. Students should note that there should be no gaps between or overlaps of the tiles. Be sure to have students discuss the actual area of the total rectangle based on the dimensions (30 square units).

TEACHER SAY: Good job. What is the perimeter of this rectangle? Lean and Whisper.

STUDENTS DO: Whisper answer: 26 units.

Learn (35 to 45 minutes)

Directions

1. TEACHER DO: Have a set of number cards 0 to 6 or a six-sided die available.

TEACHER SAY: Today's learning goal is to explore a property of multiplication. In math, a PROPERTY is a characteristic that is specific to an operation. Today's property is called the Associative Property of Multiplication. Let's explore it together.

TEACHER DO: Use **Calling Sticks** to choose a student to come to the front.

STUDENTS DO: Selected student comes to the front, picks or rolls three numbers, and records a multiplication problem on the board. Example: 5 × 6 × 3.

TEACHER SAY: We have three factors. Does it matter which ones we multiply first? Do we have to start with the first two or can we choose any two? Turn and discuss with your Shoulder Partner. Give me a Thumbs Up to share your thinking.

STUDENTS DO: Talk to partner about the problem. Give a **Thumbs Up** to share. Selected students explain thinking.

TEACHER DO: Give students 1 to 2 minutes to discuss and then call on students to share thinking. Each time a student shares, have them explain the choice. Are they being strategic in choosing factors that create an easier initial multiplication fact? For example, multiplying 5 × 6 in this example may be easier because counting by 5s is an efficient strategy, and then multiplying by 3 can be easily done with repeated addition. Ask students questions such as:

- Why did you choose to start with those factors?
- Which two factors make the most sense for you to start with? Why?

As students share which two factors they would multiply first, rewrite the equation and place parentheses around the factors. For example, if a student states that they would multiply the first two factors and then multiply the product by the third, rewrite the initial equation as (5 × 6) × 3. If they state that they would multiply the second and third factors first, rewrite as 5 × (6 × 3), and so on.

2. TEACHER SAY: Good thinking. As you were sharing the order in which you would multiply, I put in grouping symbols. We have used these before, and they are called PARENTHESES. Mathematicians use parentheses to group the two factors they would multiply first. When you told me your first two factors, I grouped them using parentheses.

If you think the final product will be the same no matter what order we multiply the factors, stand up. If you think the final product will be different if the order is different, stay seated.

STUDENTS DO: Show thinking by standing or sitting.

TEACHER SAY: Let's test out your predictions.

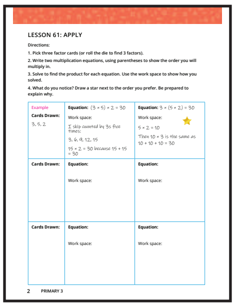
TEACHER DO: Divide the class into three groups. Number the groups 1 to 3. Write the following on the board:

- Group 1: (5 × 6) × 3 =
- Group 2: (6 × 3) × 5 =
- Group 3: (5 × 3) × 6 =

TEACHER SAY: Work independently and use a strategy that works for you. You can show your work at the bottom of the Connect page in your student book. Give me a Thumbs Up when you have the final product.

STUDENTS DO: Solve the problem in the order the group was assigned. Give a **Thumbs Up** to share. Selected students from each group share answers.

TEACHER DO: Record students' answers on the board. Ask students to discuss what they observe about the three products and to explain how this information may help them solve multiplication problems moving forward.



3. TEACHER SAY: Please turn in your student book to page Lesson 61: Apply and read the directions silently. I will choose one of you to read aloud.

STUDENTS DO: Turn to page in student book and read the directions. Selected student reads the directions aloud.

TEACHER DO: Make sure students understand the directions. Review the example as needed. Answer any questions they may have about the procedure. Distribute number cards (or dice) to students. Encourage students who finish early to try the Challenge problems.

STUDENTS DO: Ask clarifying questions as needed. Work independently to create multiplication equations with three factors, solving each problem two ways. Students who finish early can work on the Challenge problems.

TEACHER DO: Walk around the room and observe students as they work. Ask students questions such as:

- Why did you decide to multiply those factors first? Was it random or something about the numbers themselves?
- What are you noticing about the product of each problem?
- When might you need to multiply three numbers?

Students should show work. Some may just know facts and can write each product, and others may show work using an array or skip counting. When 5 minutes are left in Learn, use an **Attention Getting Signal**.

4. TEACHER SAY: I see a lot of hard work happening. Earlier we noticed that it did not matter which two factors we multiplied first because we still got the same final product. Stand up if that was true for the problems you created and solved.

STUDENTS DO: Stand up if agree or stay seated if disagree.

TEACHER DO: Call on a student who is standing to share one equation that they created and tested. Record work on the board. If anyone is sitting, have them share and discuss why they did not get the same product. If they do not find the error while explaining, allow another student to help them find and correct errors.

TEACHER SAY: I would also like to hear why you grouped the numbers the way you did. Please raise your hand if you would like to share why you put a star next to one of your equations.

STUDENTS DO: Raise hand to share rationale.

TEACHER DO: Listen and probe as needed, asking why students preferred one order over another. One reason may be that some facts are easier than others, so starting with the easier facts makes the whole problem more accessible.

TEACHER SAY: You did a great job exploring the Associative Property of Multiplication and explaining how it is helpful to know the property when we have to multiply more than two numbers. We can multiply in any order, and it makes sense to pick the order that is most efficient for you. Please put away supplies. You will need your student book for Reflect.

Reflect (5 to 10 minutes)

Directions

1. TEACHER DO: Have students work with a **Shoulder Partner** to define the Associative Property in their own words.

STUDENTS DO: Talk to partner and share ideas to craft a class definition of the Associative Property.

TEACHER DO: After 1 to 2 minutes, call on students to share ideas. Synthesize students' ideas into a definition such as:

Associative Property of Multiplication: The factors in a multiplication problem can be multiplied in any order and still total the same product. If there are more than two factors, I can use parentheses to show the factors I will multiply first.

Write the definition and an example on the board.
$(4 \times 3) \times 2 = 24$
$(3 \times 2) \times 4 = 24$
$(4 \times 2) \times 3 = 24$

TEACHER SAY: Great job. You will now copy this definition and example in a new section of your student book. Turn to the back of your book and find the first page of the section called Math Vocabulary. This will be a place where we can write the definitions of math words that are important to remember and that we can reference. Record our class definition of the Associative Property of Multiplication.

STUDENTS DO: Record class definition of Associative Property in the new Math Vocabulary section of the student book.

Lesson 62 Overview

LESSON OVERVIEW

To begin today's lesson, students review the Associative Property in the context of a problem. In Learn, students use visual models to explore the Distributive Property. This allows students to demonstrate how the Distributive Property works. There is not a single correct way to break up the factors, which reinforces the importance of flexibility and allows students to personalize strategies. In Reflect, students think about how the Distributive Property can help them solve problems with larger factors.

LEARNING OBJECTIVES

Students will:

- Explain the Distributive Property of Multiplication.
- Apply the Distributive Property of Multiplication to solve problems.
- Collaborate to define math terminology in their own words.

LESSON PREPARATION FOR THE TEACHER

No additional preparation needed.

KEY VOCABULARY

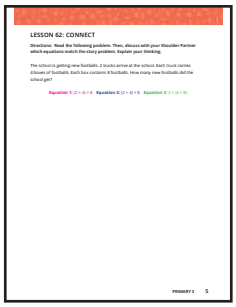
- Addend
- Bar model
- Distributive Property of Multiplication
- Factors
- Product

MATERIALS

- Colored pencils or markers
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 62: CONNECT

Directions: Read the following problem. Then, discuss with your Shoulder Partner which equations match the story problem. Explain your thinking.

The school is getting new footballs. 2 trucks arrive at the school. Each truck carries 4 boxes of footballs. Each box contains 8 footballs. How many new footballs did the school get?

Equation 1: 2 × 4 × 8 Equation 2: (2 × 4) × 8 Equation 3: 2 × (8 × 8)

PRIMARY 1 5

1. TEACHER SAY: Please open your Mathematics Student Book to page Lesson 62: Connect. Read the directions and the story problem silently and think about your answer. Then, turn to your Shoulder Partner and discuss which equations match the problem and explain your thinking. Give me a Thumbs Up when you are ready to share.

STUDENTS DO: Read the problem and think about the possible solutions shown. Identify the strategies that work, talk to partner about the correct equations, and explain thinking.

TEACHER DO: After 2 to 3 minutes, call on students to share ideas. Ask students to explain and allow them to show work on the board, if needed. Guide students to see that Students 1 and 3 have valid equations.

TEACHER SAY: Raise your hand if you remember what property of multiplication this problem is an example of.

STUDENTS DO: Raise hand to volunteer. Selected students answer. (Associative Property)

Learn (35 to 45 minutes)

Directions

1. TEACHER DO: Draw the following on the board. Some students may note that this problem can also be solved with the Commutative Property, and do 6 x 8 = 8 x 6. Remind them that this is the Commutative Property and encourage students to try it with 8 groups of 6.

6 × 8 = ?

6	6	6	6	6	6	6	6

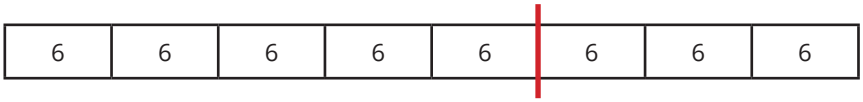
TEACHER SAY: Today our learning goal is to explore and apply the Distributive Property, which is something that can help us understand how to solve multiplication problems that involve larger factors. On the board is the multiplication problem 6 × 8. Underneath the problem, instead of drawing an array, I have drawn a long strip of 8 boxes with the number 6 inside each one. This is called a BAR MODEL. It shows a long bar broken up into 8 groups of 6. Turn to your Shoulder Partner and solve the problem if you do not already know the answer. Give me a Thumbs Up when you are ready to share.

STUDENTS DO: Solve the problem with partner. Give a **Thumbs Up** to share. Selected students share the product and chosen strategies.

TEACHER DO: Try to find students who used different strategies to solve the problem. If a student suggests breaking up the strip into two smaller facts, use their explanation to model the Distributive Property as shown below. If no student suggests breaking up the problem into two smaller problems, describe the process in detail as stated below.

TEACHER SAY: Nice work. We heard many effective strategies. I am going to model a new strategy. I am going to break the bar model into two smaller chunks that make the multiplication easier for me. When I do that, I try to pick numbers that I can multiply quickly or in my head. Multiplying by 5 is easy, so I am going to draw a line separating 5 of these bars.

TEACHER DO: Model counting 5 bars and draw a line to separate the 5th bar from the 6th one.



TEACHER DO: Under the first set of bars, write 5 × 6.

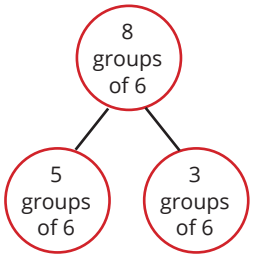
TEACHER SAY: How many bars do I have left? Call out.

STUDENTS DO: Call out: 3.

TEACHER DO: Write 3 × 6 under the last 3 bars.

TEACHER SAY: I did not take any bars away from the model, so I can multiply 5 and 6, then multiply 3 and 6, and then add the products together to get the total. Watch carefully as I model this on the board and record my process. I want to hear your questions when I am done.

TEACHER DO: Model as shown below to share visual and numeric representations of the strategy:



5 × 6 = 30 (model skip counting by 5s)
3 × 6 = 18
(5 × 6) + (3 × 6) = 8 × 6
30 + 18 = 48 so 8 × 6 = 48

STUDENTS DO: Observe teacher. Ask clarifying questions as needed.

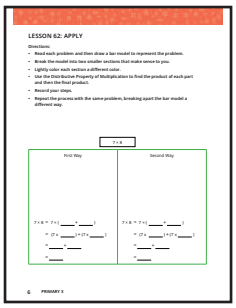
2. TEACHER SAY: Breaking up a larger problem into two smaller problems as I just did is an example of the Distributive Property of Multiplication. Many of you have been doing this already without knowing that it is an important property of mathematics. This property allows us to break apart one of the factors and distribute it across two smaller multiplication problems. In this problem, we broke apart 8 and then multiplied each new part by 6. I used parentheses to show what I was multiplying. Who has a different way they could model breaking up this problem? Raise your hand.

STUDENTS DO: Raise hand to volunteer. Selected students share strategies for using the Distributive Property of Multiplication.

TEACHER DO: Call on one or two students to come to the front and model a different way to break up this problem. Have students draw number bonds and write equations to model solutions. Be sure students explain thinking as they work.

TEACHER SAY: Great. There is more than one way to break up this problem and distribute the 6 between the two addends of 8. Some of you may be really good at your 2s facts so you could break apart the bar model into 6 groups of 6 and 2 groups of 6. Give me a Thumbs Up if this process makes sense to you. Give me a Thumbs Middle if you need to see more examples. If you want to see more examples, stay here with me after I give the directions for the next activity.

STUDENTS DO: Show understanding using **Thumbs Up** or Thumbs Middle.


LESSON 62: APPLY

Directions:

- Read each problem and then draw a bar model to represent the problem.
- Break the model into two smaller sections that make sense to you.
- Lightly color each section a different color.
- Use the Distributive Property of Multiplication to find the product of each part and then the final product.
- Record your steps.
- Repeat the process with the same problem, breaking apart the bar model a different way.

7 × 8

First Way

Second Way

7 × 8 = 7 × (___ + ___)

= (7 × ___) + (7 × ___)

= ___ + ___

= ___

7 × 8 = 7 × (___ + ___)

= (7 × ___) + (7 × ___)

= ___ + ___

= ___

6 PRIMARY 3

3. TEACHER SAY: Please open your student book to page Lesson 62: Apply and read the directions silently. I will call on one of you to read the directions aloud.

STUDENTS DO: Open book to page Lesson 62: Apply and read the directions. Selected student reads aloud the directions.

TEACHER DO: Make sure students understand the directions. Explain that, for the first two problems, the steps have already been set up. Encourage students who finish early to work on the Challenge problem.

Work with the students who need more practice to solve some practice problems (not the ones in the student book). **Model** the steps and the recording process and encourage students to help you explain what you are doing at each step (and why you are doing it). Have students who are ready to work independently go back to their seats and work on the Apply page. If possible, walk around the room to observe students as they work. Ask them to explain the chosen process. Take note of students who can break apart the problem but struggle to record the steps.

STUDENTS DO: Work with the teacher on practice problems or work independently in the book. Students who finish early can work on the Challenge problem.

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: Today we explored another property of multiplication called the Distributive Property of Multiplication. The Distributive Property says we can take one of the factors in a multiplication problem and break it into smaller parts to find simpler multiplication problems. Then, we add the products together to find the total product. Think for a moment about how using the Distributive Property can help you solve multiplication problems with large factors. I will give you a minute to think about how you could explain it to someone at your house. When you have an answer, give me a Thumbs Up.

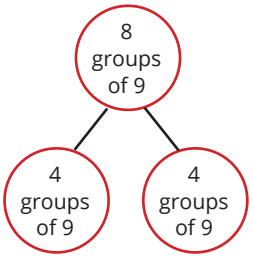
TEACHER DO: Give students 1 minute of **Wait Time**. Then, ask two to four students to share thinking with the larger group. Guide students to note that breaking up the factors into smaller facts that are easy to solve, such as 5s, 10s, or 2s, makes challenging problems less challenging. It is also more efficient than skip counting by one of the factors or having to draw a large array and count the individual boxes.

TEACHER SAY: You did a wonderful job of explaining the Distributive Property. This property is one you can use often to help you with multiplication and can is an important problem-solving strategy. Let's capture your ideas in one definition together. I will write the definition on the board and you will copy it in the Math Vocabulary section of your student book.

TEACHER DO: On the board, synthesize students' thinking into a class definition, such as the following:

Distributive Property of Multiplication: When multiplying larger factors, I can break apart one of the factors into two smaller factors. If I multiply each of the two smaller factors by the other factor and add together their products, I will get the product for the original problem.

Example: 8 × 9



(4 × 9) + (4 × 9) = 8 × 9
4 × 9 = 36
36 + 36 = 72
8 × 9 = 72

STUDENTS DO: Copy the definition and example in the student book.

Lesson 63 Overview

LESSON OVERVIEW

Students begin today's lesson with a matching problem that reviews the Distributive Property. In Learn, they apply properties and strategies to solve a variety of multiplication problems while also using estimation to help check the reasonableness of answers. At the end of the lesson, they reflect on their understanding and use of different properties of multiplication to solve problems.

LESSON PREPARATION FOR THE TEACHER

No additional preparation needed.

LEARNING OBJECTIVES

Students will:

- Apply strategies to estimate products.
- Apply properties and strategies to solve multiplication problems.
- Explain chosen problem-solving strategies.

KEY VOCABULARY

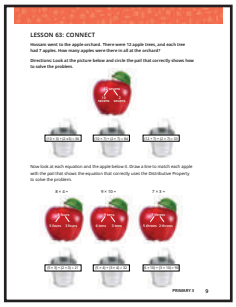
- Estimation
- Product
- Reasonableness

MATERIALS

- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 63: CONNECT

Hassam went to the apple orchard. There were 12 apple trees, and each tree had 7 apples. How many apples were there in all at the orchard?

Directions: Look at the picture below and circle the pail that correctly shows how to solve the problem.

Now look at each equation and the apple below it. Draw a line to match each apple with the pail that shows the equation that correctly uses the Distributive Property to solve the problem.

8 × 4 = 9 × 10 = 7 × 6 =

PRIMARY 3 9

1. TEACHER SAY: We have been exploring properties of multiplication to make it easier for us to solve complex multiplication problems. Please open to page Lesson 63: Connect in your Mathematics Student Book and read the problem silently. Give me a Thumbs Up to share what property we could use—and what equation we could write—to solve this problem.

STUDENTS DO: Open student books to the Connect page, read the problem, and give a **Thumbs Up** to share thinking. Selected students identify the property they would use to solve the problem and the equation they would write.

TEACHER DO: If necessary, guide students to identify the property as the Distributive Property and the equation as 12 × 7 = _____. Record on the board.

TEACHER SAY: Look at the three pails in the picture below the problem. Circle the pail that shows how we could use the Distributive Property to solve 12 × 7. Raise your hand when you are ready to talk about it.

STUDENTS DO: Review the pails and circle the one that correctly uses the Distributive Property.

TEACHER DO: After about 1 minute, have students share thinking. If necessary, ask questions to help students understand that the middle pail is correct. Read aloud the directions for the second review problem and have students work independently to solve it. Check answers together, clearing up misconceptions and errors as needed.

TEACHER SAY: Great. The Distributive Property is a good tool that can help us solve challenging multiplication problems. We will work more with it today.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today our goal is to practice solving a variety of multiplication problems using strategies and properties we have learned. We also want to think about how we can use estimation to help us predict and then check the reasonableness of our answers. Who can remind us of what it means to ESTIMATE?

STUDENTS DO: Selected students share definitions and examples of estimation.

TEACHER DO: Before moving on, make sure students have an understanding of what it means to estimate and have at least one strategy for doing it (for example, front-end estimation, rounding, or using "neighbor" facts, such as 9 × 5 and 10 × 5). Remind students that an estimate is not the exact answer but is close. Possible examples:

6 × 7 = _____

- I know that 5 × 5 is 25, so the product of 6 × 7 must be greater than 25.
- I know that 6 × 10 = 60, so the product must be less than 60.
- I know that 5 × 7 = 35, so the product should be a little more than 35.

2. TEACHER SAY: Let's try estimating the product of 3 × 4 × 5. Give me a Thumbs Up when you have an idea and can explain how you estimated. Remember we are not calculating the exact answer.

STUDENTS DO: Use a strategy to estimate the product and give a **Thumbs Up** when ready to share. Selected students share thinking.

TEACHER DO: Call on two or three students to share estimates. Record on the board and ask students to explain how they determined the estimates. Note that the estimates may be different from each other, but good estimation strategies can help us get an idea of the final answer.

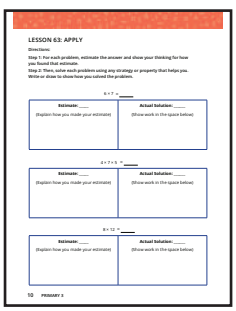
TEACHER SAY: Turn and Talk to your Shoulder Partner about how you would find the exact product. If you can, find the exact product, but I am more interested in how you would solve the problem. Raise your hand when you are ready to share.

STUDENTS DO: Talk to **Shoulder Partner** about possible solution strategies. Raise hand to volunteer.

TEACHER DO: Call on students to share. Students may share (3 × 4) × 5, 3 × (4 × 5), or (3 × 5) × 4 or some combinations of the Associative and Distributive properties.

TEACHER SAY: Stand up if your estimate was close to the actual product. Remain seated if it was not. Remember, we are still learning how to estimate so it is okay if your estimate was not close. We will learn together. Raise your hand if you can explain why your estimate was or was not close to the actual answer.

STUDENTS DO: Stand up if estimate was close. If called on, share thinking about why it was close. Remain seated if estimate was not close. If called on, share thinking about why it was not close.


LESSON 63: APPLY

Directions:

Step 1: For each problem, estimate the answer and show your thinking for how you found that estimate.

Step 2: Then, solve each problem using any strategy or property that helps you. Write or draw to show how you solved the problem.

6 × 7 = ____

Estimate: ____ (Explain how you made your estimate)

Actual Solution: ____ (Show work in the space below)

4 × 7 × 5 = ____

Estimate: ____ (Explain how you made your estimate)

Actual Solution: ____ (Show work in the space below)

8 × 12 = ____

Estimate: ____ (Explain how you made your estimate)

Actual Solution: ____ (Show work in the space below)

10 PRIMARY 2

3. TEACHER SAY: Great, now let's solve some problems. Please open your student book to page Lesson 63: Apply and read the directions silently. I will call on one of you to read the directions aloud.

STUDENTS DO: Turn to the Apply page and read the directions. Selected student reads aloud the directions.

TEACHER DO: Make sure students understand the directions before moving on. Encourage students who finish early to complete the Challenge problem.

STUDENTS DO: Work independently to estimate products and solve problems. Students who finish early can try the Challenge problem.

TEACHER DO: Walk around the class, observing students as they work. Ask students questions such as:

- What strategy are you using to estimate?
- What strategy are you using to find the exact product?
- Was your estimate close to the actual product? Why or why not?

When 5 minutes are left in Learn, bring the group back together.

4. TEACHER SAY: Look at the problems you solved. Place a star next to any problems that you used the Distributive Property to solve. Circle any problems that you used the Associative Property to solve. Finally, put a square around the most challenging problem you worked on today. Keep out your student books for Reflect.

STUDENTS DO: Place stars, circles, and squares on problems.

Reflect (5 to 10 minutes)

Directions

1. TEACHER DO: Have students turn to a **Shoulder Partner** and share work. Students should compare problem-solving strategies (starred and circled) and discuss the problem that was most challenging for each of them.

STUDENTS DO: Share work with partner. Discuss strategies and challenges. Compare problem-solving strategies and solutions.

TEACHER DO: After about 3 minutes, ask students to share observations.

TEACHER SAY: Great work today with multiplication. Put away your books and give your partner a high five for listening and sharing.

Lesson 64 Overview

LESSON OVERVIEW

It is important to review previously taught skills so students do not forget. Consequently, this lesson begins with a review of telling time to the minute. In Learn, students are presented with an Essential Question that guides the lesson as they explore the relationship between multiplication and division. They use understanding of that relationship to solve equations and story problems that involve an unknown number. In Reflect, they answer the Essential Question that was posed at the beginning of the day's Learn.

LEARNING OBJECTIVES

Students will:

- Tell time to the minute.
- Explain the relationship between multiplication and division.
- Solve multiplication and division problems with an unknown number.
- Explain how they can use the relationship between multiplication and division to solve problems.

KEY VOCABULARY

- Fact family
- Factor
- Hour
- Inverse
- Minute
- Product
- Quotient

MATERIALS

- Teaching clock or large handmade clock
- Mathematics Student Book and pencil

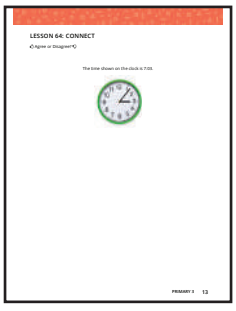
LESSON PREPARATION FOR THE TEACHER

- Prior to the lesson, write the following Essential Questions on the board:
  - What is the relationship between multiplication and division?
  - How can we use this relationship to solve multiplication and division problems?
- Prior to the lesson, write the following story problem on the board:

An art teacher has 40 paintbrushes. She divides them equally among her 4 students. How many paintbrushes will each student get?

Connect (10 to 15 minutes)

Directions


LESSON 64: CONNECT

(Agree or Disagree?)

The time shown on the clock is 7:03.

PRIMARY 1 13

1. TEACHER SAY: Please open your Mathematics Student Book to page Lesson 64: Connect. Look at the clock problem and decide if you agree or disagree. Give me a Thumbs Up or thumbs down to share your thinking.

STUDENTS DO: Turn to the Connect page. Read the problem and give a **Thumbs Up** or thumbs down to show thinking.

TEACHER DO: Give students about 1 minute to think. Then, ask students to explain their thinking. Ask students who disagreed to explain the error (the student mixed up the minute and hour). If students seem to be struggling to understand time to the minute, go through a few examples. Use a teaching clock, if available.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today our learning goal is to try and answer these Essential Questions:

- **What is the relationship between multiplication and division?**
- **How can we use this relationship to solve multiplication and division problems?**

An Essential Question is one that guides our thinking and learning. It is important information we want to know and understand by the end of the class. To think about these questions, let's look at a problem together.

2. TEACHER DO: Direct student's attention to the problem on the board and read it aloud.

TEACHER SAY: Raise your hand if you can tell us what is the unknown in this problem. What are we trying to find?

STUDENTS DO: Raise hand to volunteer. Selected students share thinking.

TEACHER DO: If no students identify the unknown as the number of paintbrushes each student gets, ask questions to guide their thinking.

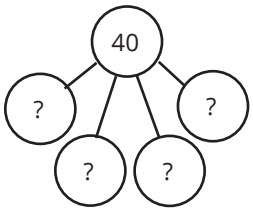
TEACHER SAY: Raise your hand if you can tell us an equation we could write to solve this problem.

STUDENTS DO: Raise hand to volunteer. Selected students share an equation.

Note to the Teacher: Students may identify 40 ÷ 4 = _____ or 4 × _____ = 40.

TEACHER DO: Write students' equation(s) on the board and then draw a number bond to show a division model for the problem, as shown below.

40 ÷ 4 = _____ 4 × _____ = 40



TEACHER SAY: Does my drawing match the problem? Raise your hand to share your thinking.

STUDENTS DO: Raise hand to volunteer. Selected students share thinking with the group.

TEACHER DO: If a student mentioned _____ × 4 = 40, write the equation on the board.

TEACHER SAY: My model shows 40 divided by 4. But how can this multiplication equation also help us solve this problem?

TEACHER DO: Use **Calling Sticks** to select students to share thinking. If appropriate, draw the model below on the board next to the division model.

◯ x 4 = 40

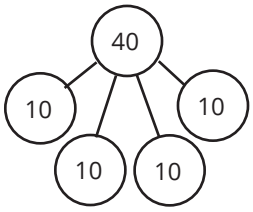
TEACHER SAY: Raise your hand if you know how many 4s it takes to get to 40.

STUDENTS DO: Raise hand to volunteer. Selected students share thinking.

TEACHER DO: Have students skip count by 4s to 40 to confirm volunteers' thinking (or to provide an answer if they did not know).

STUDENTS DO: Skip count aloud by 4s to 40. Students should note that the answer is ten 4s.

TEACHER SAY: It took us 10 groups of 4 to get to 40. 10 × 4 = 40 and 40 ÷ 4 = 10. I can show that in my part-part-whole model.



TEACHER DO: Fill in the circles on the model and the missing number in the equations on the board. Note that 10 makes each equation true.

3. TEACHER SAY: Let's try another problem.

TEACHER DO: Write 15 ÷ 5 = _____ on the board.

TEACHER SAY: Can you think of a story problem that matches this equation? Turn and Talk to your Shoulder Partner. See if you can make up a story problem together. I will use Calling Sticks to hear some of your ideas.

STUDENTS DO: Create a story problem with partner. Selected partners share story problems with the group.

TEACHER DO: Make sure that each shared problem matches the equation. If not, ask other students to help clarify.

TEACHER SAY: Great work creating story problems. The answer to a division problem is called the quotient. Is there a multiplication equation we could write that would help us solve 15 ÷ 5? Give me a Thumbs Up if you have an idea.

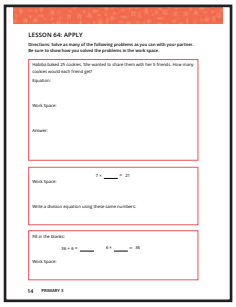
STUDENTS DO: Give a **Thumbs Up** to volunteer. Selected students share thinking.

TEACHER DO: Ask students to explain why 5 × ___ = 15 or _____ × 5 = 15 can be helpful in solving the division problem. If no students identify those multiplication equations, guide their thinking to help them make the connection. Ask questions to help students notice that, just as addition and subtraction are related, multiplication and division are too. The numbers 3, 5, and 15 are all part of a fact family. Multiplication and division are inverse operations, just like addition and subtraction.

TEACHER SAY: What is the missing number for both of these equations? Show me on your fingers.

STUDENTS DO: Hold up fingers to show answers.

TEACHER DO: Confirm 3 as the correct answer.


LESSON 64: APPLY

Directions: Solve as many of the following problems as you can with your partner. Be sure to show how you solved the problems in the work space.

Work Space:

Answer:

Work Space:

Write a division equation using these same numbers:

Work Space:

14 PRIMARY 2

4. TEACHER SAY: Knowing how multiplication and division are related helps us solve problems. We can use that understanding to help us find an unknown number. If we are stuck on a division problem, we might think of it as a multiplication problem. Let's practice solving some multiplication and division problems. Please open your student book to page Lesson 64: Apply and read the directions silently.

STUDENTS DO: Open book to the Apply page and read the directions silently. Selected student reads the directions aloud to the class.

TEACHER SAY: In your book there are story problems and some problems that are just equations. Some ask you to think about the connection between multiplication and division. For story problems, be sure to write the equation that you used to solve the problem. Show your

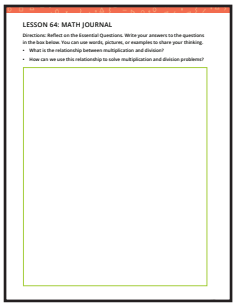
work in the work space. You can use any strategy that works for you. We have been doing a lot of independent work, so today let's use Hands Up Pair Up to find a partner and work together. Remember, if you finish early, you can try the Challenge problems.

STUDENTS DO: Use **Hands Up Pair Up** to find a partner. Work together to solve the problems in the student book. Students who finish early can work on the Challenge problems.

TEACHER DO: Walk around the room, observing students as they work. Check to see that they can solve both story problems and numerical equations with an unknown. At the end of Learn, bring the group back together for Reflect.

Reflect (5 to 10 minutes)

Directions


LESSON 64: MATH JOURNAL

Directions: Reflect on the Essential Questions. Write your answers to the questions in the box below. You can use words, pictures, or examples to share your thinking.

- What is the relationship between multiplication and division?
- How can we use this relationship to solve multiplication and division problems?

1. TEACHER SAY: Today started with Essential Questions. Let's review those questions together and think about what we learned. Turn to page Lesson 64: Math Journal in your book and read the directions silently.

STUDENTS DO: Turn to the Math Journal page and read the directions.

TEACHER DO: Read aloud the Essential Questions or have student volunteers read them.

- What is the relationship between multiplication and division?
- How can we use this relationship to solve multiplication and division problems?

TEACHER SAY: Think about what you have learned today and write your answers to those two questions. You can include pictures, numbers, and examples.

STUDENTS DO: Write a response to the Essential Questions.

TEACHER DO: Allow 3 to 4 minutes for students to write a response to the prompt. Collect books at the end of the lesson to read student responses and assess understanding of the Essential Questions.

Lesson 65 Overview

LESSON OVERVIEW

In this lesson, Connect provides an opportunity to discuss and record strategies students know and use to solve multiplication and division problems. You will record these strategies on an anchor chart that will serve as a reference for today's Learn and future lessons. Having a chart that lists various strategies with models and examples shows students the many different options that exist to solve problems and values the thinking of all students. For Reflect, students select a favorite strategy and justify the selection.

LEARNING OBJECTIVES

Students will:

- Identify a variety of multiplication and division problem-solving strategies.
- Apply more than one strategy to solve multiplication and division problems with an unknown number.
- Justify the use of preferred problem-solving strategies.

KEY VOCABULARY

- Justify
- Product
- Quotient
- Strategies

MATERIALS

- Multiplication and Division Strategies anchor chart
- Properties of Multiplication anchor chart
- Mathematics Student Book and pencil

LESSON PREPARATION FOR THE TEACHER

- Create a large anchor chart labeled **Multiplication and Division Strategies**. You will add strategies to the chart during the lesson. See Chapter Preparation for Lesson 65 for details.
- Create another large anchor chart labeled **Properties of Multiplication**. Add the Associative, Commutative, and Distributive properties. Include a very brief description and an example. See Chapter Preparation for Lesson 65 for an example.

Connect (10 to 15 minutes)

Directions

1. TEACHER SAY: You have learned so many strategies for solving multiplication and division problems that I think it would be a good idea if we wrote them down. That way, we can look at the list to choose a strategy to solve problems.

TEACHER DO: Display the blank Multiplication and Division Strategies and Properties of Multiplication anchor charts. Start with 6 × 9 and ask for as many problem-solving strategies as students can share. Record each strategy on the anchor chart along with an example. Some examples might include:

- Draw an array
- Make a bar model

9	9	9	9	9	9

- Skip count by one of the factors
- Use a "helper fact" (9 × 5 = 45)
- Use the 120 Chart
- 9s finger trick
- Use a property of multiplication

Repeat the process for division strategies. Some examples might include:

- Part-part-whole model
- Inverse operations (Think of 42 ÷ 6 as 6 × ? = 42)
- Skip count by a factor to the total
- Missing factor in an array

STUDENTS DO: Identify multiplication and division problem-solving strategies. Volunteers should explain the chosen strategy to the group and serve as the teachers of the strategy.

Note to the Teacher: The strategies anchor chart should be expanded throughout the year as students learn new strategies. If there is not enough time today to add all of the strategies, record one or two for today and find time to add more later.

TEACHER SAY: Thank you for your help. Our anchor charts will hang in our class to remind us of all the ways we can solve problems.

Learn (35 to 45 minutes)

Directions

1. TEACHER DO: Write the following on the board:

$$8 \times \_\_\_\_\_ = 40$$

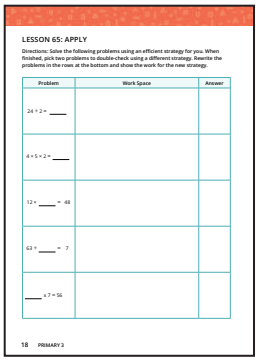
One strategy	Another strategy

TEACHER SAY: Now that we have looked at a variety of strategies, our goal for today is to solve some problems using more than one strategy. Remember when we discussed addition and subtraction strategies and how some problems might need different strategies to solve? Many of us may also pick different strategies for the same problem or have our favorite strategies that we always use. Practicing other strategies builds flexibility of thought that good mathematicians need.

On the board, I have written another multiplication problem. Solve the problem using any of the strategies we just discussed or another strategy you know. Give me a Thumbs Up when you are ready to share your answer and explain the strategy you used.

STUDENTS DO: Work for 1 to 2 minutes to solve the problem. Give a **Thumbs Up** to volunteer. Selected student shares answer and shows work on the board in the first box.

TEACHER DO: Ask for someone who solved the problem a different way. Have that student come up to record the chosen strategy and show work on the board in the second box. If time allows, you can ask for others to also share, but two different strategies is sufficient to model the activity.


LESSON 65: APPLY

Directions: Solve the following problems using an efficient strategy for you. When finished, pick two problems to double-check using a different strategy. Rewrite the problems in the rows at the bottom and show the work for the new strategy.

Problem	Work Space	Answer
24 ÷ 2 = ___		
4 × 5 × 2 = ___		
12 × ___ = 48		
63 ÷ ___ = 7		
___ × 7 = 56		

18 PRIMARY 3

2. TEACHER SAY: Great. Two different mathematicians found the missing factor to be 5 and used two different strategies to solve the same problem. Please open your Mathematics Student Book to page Lesson 65: Apply and read the directions silently.

STUDENTS DO: Open book to the Apply page and read the directions. Selected student reads the directions aloud.

TEACHER SAY: Each of the problems on the Apply page has an unknown product. You may need to find the product. You may need to find the quotient. Or you may need to find the missing factor or divisor.

TEACHER DO: Make sure students understand the directions. Encourage students who finish early to try the Challenge problems.

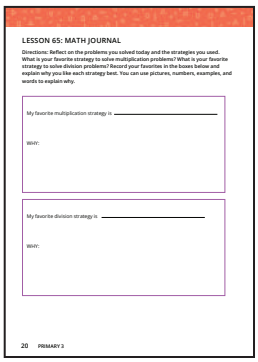
STUDENTS DO: Work independently to select a strategy and solve the problems. Once finished, select two problems to solve again using a different strategy. Students who finish early can work on the Challenge problems.

TEACHER DO: Walk around the class, observing students as they work. Offer assistance to students who are struggling and note who might need extra support at a different time to review strategies. When Learn is almost over, use an **Attention Getting Signal**.

TEACHER SAY: **Nice work solving multiplication and division problems using multiple strategies. Keep out your books for Reflect.**

Reflect (5 to 10 minutes)

Directions


LESSON 65: MATH JOURNAL

Directions: Reflect on the problems you solved today and the strategies you used. What is your favorite strategy to solve multiplication problems? What is your favorite strategy to solve division problems? Record your favorites in the boxes below and explain why you like each strategy best. You can use pictures, numbers, examples, and words to explain why.

My favorite multiplication strategy is _____

WHY:

My favorite division strategy is _____

WHY:

20 PRIMARY 3

1. **TEACHER SAY:** **Turn to page Lesson 65: Math Journal in your student book and read the journal prompt silently.**

STUDENTS DO: Turn to the journal page and read the prompt to themselves.

TEACHER SAY: **Think for a minute about your favorite strategies for solving multiplication and division problems. Record it in your book in the box and then justify, or explain, why that strategy works best for you.**

STUDENTS DO: Write an answer to the prompt on the Math Journal page.

TEACHER DO: Collect books to see what some of the preferred strategies are for the group and why.

TEACHER SAY: **Great work today. When you can justify—or explain—why you use or prefer a strategy, you demonstrate deep understanding of that strategy and of yourself as a mathematician and learner. We will keep referencing these strategies all year and use them in future lessons as we get more and more comfortable with multiplication and division.**

Lesson 66 Overview

LESSON OVERVIEW

In this lesson, students begin by reviewing what they know about shapes and perimeter in a Word Splash. Students then use knowledge of shape attributes to calculate the perimeter of shapes with an unknown side length.

LESSON PREPARATION FOR THE TEACHER

- Create three Word Splash diagrams on the board—one for square, one for rectangle, and one for perimeter. See example for Square.

LEARNING OBJECTIVES

Students will:

- Solve perimeter problems involving an unknown side length.

KEY VOCABULARY

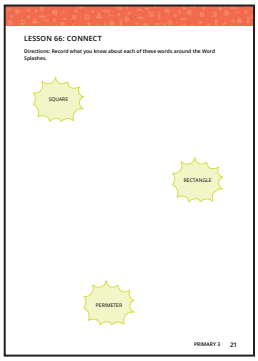
- Length
- Parallel
- Perimeter
- Width

MATERIALS

- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 66: CONNECT

Directions: Record what you know about each of these words around the Word Splashes.

SQUARE

RECTANGLE

PERIMETER

PRIMARY 3 21

1. TEACHER SAY: Today we are going to do an activity called Word Splash. You will start on your own, then work with a partner, and then we will share out. Please open your Mathematics Student Book to page Lesson 66: Connect and read the directions silently.

STUDENTS DO: Turn to the Connect page and read the directions. Selected student reads the directions aloud to the class. Work for 1 minute to write what they know about squares, rectangles, and perimeter.

TEACHER SAY: Now, turn and share with your Shoulder Partner and see if you can add any more ideas. You have 1 minute.

STUDENTS DO: Work with **Shoulder Partner** for 1 minute to share ideas.

2. TEACHER SAY: Now, let's create a class one. If you have an idea to add to our class Word Splash diagrams, raise your hand.

STUDENTS DO: Raise hand to share everything they know about squares, rectangles, and perimeter.

TEACHER DO: Ensure the following ideas are either shared by students or are included by you (other ideas welcomed):

Squares:

- Have four equal sides (each side is the same length as the other three)
- Have four corners/vertices

Rectangles:

- Have two short parallel sides that are the same length
- Have two longer parallel sides that are the same length
- Have four corners/vertices

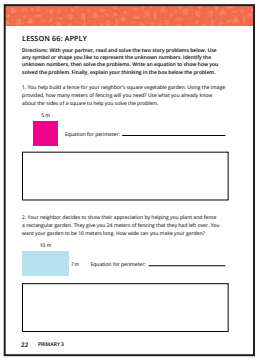
Perimeter:

- Can be measured for any polygon
- Is a linear measurement (recorded with the unit of measurement of each side)
- Is calculated by adding all sides of the shape

TEACHER SAY: You remembered a lot about these math terms. Let's apply what we know to find the perimeter of different shapes when we do not know the lengths of every side.

Learn (35 to 45 minutes)

Directions


LESSON 66: APPLY

Directions: With your partner, read and solve the two story problems below. Use any symbol or shape you like to represent the unknown numbers. Identify the unknown numbers, then solve the problems. Write an equation to show how you solved the problem. Finally, explain your thinking in the box below the problem.

1. You help build a fence for your neighbor's square vegetable garden. Using the image provided, how many meters of fencing will you need? Use what you already know about the sides of a square to help you solve the problem.

5 m

Equation for perimeter: _____

2. Your neighbor decides to show their appreciation by helping you plant and fence a rectangular garden. They give you 24 meters of fencing that they had left over. You want your garden to be 10 meters long. How wide can you make your garden?

10 m

7 m Equation for perimeter: _____

22 PRIMARY 3

1. TEACHER SAY: Please turn to page Lesson 66: Apply in your student book and read the first set of directions silently.

STUDENTS DO: Turn to the Apply page and read the directions. Selected student reads the directions aloud to the class.

TEACHER SAY: Today you will work to find the perimeter of a shape when there is missing information. You could be missing a side length and will need to use what you know about shapes to solve the problems. Or, you could be given the perimeter and need to calculate the side lengths. Be sure to write the equation for finding the perimeter for each problem. You can use whatever symbol or shape you like to represent the unknown number. Then, solve for the unknown number. Work with your Shoulder Partner to solve the first two problems. Then, we will discuss them together.

STUDENTS DO: Work with a partner to solve the first two problems.

TEACHER DO: Give students 4 to 5 minutes to read the problems, solve the problems, and record thinking. When most students seem to be done, call on several students to share work and explain thinking.

2. TEACHER SAY: You will now work independently on the rest of the problems. What questions do you have before you begin? This may be challenging, so persevere. If you finish early, try the Challenge problems.

STUDENTS DO: Ask questions as needed. Work independently to solve the problems. Students who finish early may try the Challenge problems.

TEACHER DO: Circulate while students work. Ask questions to gauge students' understanding. Make note of the following:

- How did students determine the missing measurements?
- Were students able to use the properties of the shapes to identify missing lengths?
- Did they add the side lengths together to find the perimeter?
- Were they able to write an equation using a symbol or shape to represent the missing number? (Note: This may be the most difficult part of the task. Offer support as needed to help students accomplish this.)

When Learn is over, use an **Attention Getting Signal**.

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: Turn to your Shoulder Partner now to share what you did, how you did it, and any challenges you faced. Compare your answers and strategies to see what you notice. We will share out in a few minutes.

STUDENTS DO: Compare and share work with a **Shoulder Partner**. Selected students share solutions, strategies, and challenges.

Lesson 67 Overview

LESSON OVERVIEW

In this lesson, students are introduced to two-step story problems using all four operations. They work to break the story problems apart and show problem-solving strategies. They also review the word perseverance and how sticking with problems when they are difficult can make them better mathematicians and learners.

LEARNING OBJECTIVES

Students will:

- Solve two-step story problems involving addition, subtraction, multiplication, or division.
- Explain the strategies they use to solve complex story problems.

LESSON PREPARATION FOR THE TEACHER

- No additional preparation needed.

KEY VOCABULARY

- Associative Property
- Perseverance

MATERIALS

- Anchor charts from Lesson 65
- Thinking Like a Mathematician anchor chart
- Associative Property of Multiplication

Connect (10 to 15 minutes)

Directions

Note to the Teacher: Students have now been introduced to a variety of quick multiplication and division activities in previous chapters. This Connect is a review and practice.

1. TEACHER DO: Choose from one of the following activities for the Connect time.

- **Mystery Multiplication:** The teacher tells the class one of the factors. Then, the student rolls a die or selects a number card and multiplies the factor by the die roll or number card picked. Example: Factor chosen is 4 and die roll is 5. Student solves 4 × 5.
- **Roll and Draw:** (Grid paper needed) Students roll one die twice or draw two cards. Students then draw an array to match the fact, solve the problem, and record the product.
- **Share the Counters:** The teacher writes three division equations on the board. Students use counters to solve the problem, record the equation, and make a drawing to show the quotient.
- **Word Wizards:** The teacher writes two or three story problems on the board and students work together to solve. The problems can be all multiplication, all division, or a combination.
- **Number Battle:** Each student gets a deck of number cards 0 to 12. Both decks are placed number side down between partners. Each student turns over the top two cards and multiplies them to find the product. Whoever has the greater product takes all four cards. Students continue until one player has no cards. They then reshuffle and play again until time is up.
- **Skip Counting:** Students play in pairs. Each pair receives one die or a set of number cards 0 to 12. One partner rolls the die or picks a card. The second partner states the first 12 multiples of the selected number. Students can use the 120 Chart if necessary for support.

STUDENTS DO: Work on the chosen fact practice for the Connect time with a partner or independently.

TEACHER SAY: Good work practicing your multiplication or division facts today. Let's get ready for the Learn part of our math class.

Learn (35 to 45 minutes)

Directions

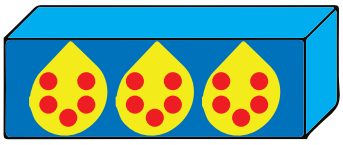
1. TEACHER SAY: Today our learning goal is to solve challenging story problems. They are challenging because you will have to use more than one operation to solve them. For example, you may need to use addition and multiplication. You will have to think deeply about the problems in order to solve them. In the past, you have solved one-step story problems. For instance, imagine I have 3 bags and inside each bag I have 5 apples. How many apples do I have in all? Raise your hand if you would like to share your thinking.

STUDENTS DO: Raise hand to volunteer. Selected students share thinking and show work on the board.

TEACHER DO: Confirm accurate thinking. Clear up misconceptions and errors as needed.

TEACHER SAY: This is an example of a one-step story problem. We only used one operation—multiplication—to solve it. Now, imagine I have 4 boxes. Each box contains 3 bags of apples. Remember, each bag contains 5 apples. How would you solve that problem?

TEACHER DO: Draw an image on the board to help students visualize the problem, such as the one shown below.

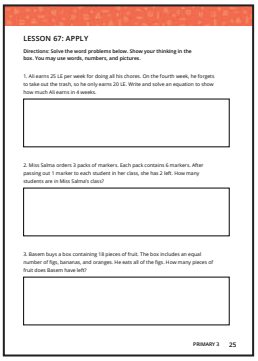


TEACHER SAY: How would you solve this problem? Turn and Talk to your Shoulder Partner.

STUDENTS DO: Talk to partner about how they would solve the problem.

TEACHER DO: Give students 3 to 5 minutes to discuss problem-solving strategies. Call on partners to share thinking with the class. Record ideas on the board. Possible responses include:

- I knew there were 15 apples in 3 bags so I multiplied 15 by 4 since there were 4 boxes.
- I multiplied 3 × 5 × 4 (or applied the Associative Property and multiplied the numbers in a different order).


LESSON 67: APPLY

Directions: Solve the word problems below. Show your thinking in the box. You may use words, numbers, and pictures.

1. Ali earns 25 LE per week for doing all his chores. On the fourth week, he forgets to take out the trash, so he only earns 20 LE. Write and solve an equation to show how much Ali earns in 4 weeks.

2. Miss Salma orders 3 packs of markers. Each pack contains 6 markers. After passing out 1 marker to each student in her class, she has 2 left. How many students are in Miss Salma's class?

3. Basem buys a box containing 18 pieces of fruit. The box includes an equal number of figs, bananas, and oranges. He eats all of the figs. How many pieces of fruit does Basem have left?

PRIMARY 3 25

2. TEACHER SAY: There are all great ways to solve this multistep problem. This problem only involved one operation—multiplication. Today's problems will involve a variety of operations. Let's try another together. Please open your Mathematics Student Book to page Lesson 67: Apply and read the directions and the first problem to yourself.

STUDENTS DO: Find the Apply page and read the directions and the first problem silently.

TEACHER DO: Call on a student to read the first problem to the class.

Ali earns 25 LE per week for doing all his chores. On the fourth week, he forgets to take out the trash, so he only earns 20 LE. Write and solve an equation to show how much Ali earns in 4 weeks.

TEACHER SAY: Raise your hand if you can explain what this problem is asking us to find out.

STUDENTS DO: Raise hand to volunteer. Selected students share their understanding of the problem.

TEACHER SAY: What information do we have to help us solve this problem? Circle the important information in the problem. Then, talk to your Shoulder Partner about how you might solve this problem. When you have an idea, show your work in your student book. Remember to use our strategy anchor chart to help you.

STUDENTS DO: Work with partner to solve the first problem on the Apply page.

TEACHER DO: Give students 5 to 8 minutes to solve this problem. Monitor them to see what strategies they are using to solve the problem. Make note of students who use different approaches so you have a variety of examples to share with the class. When most of the students are finished, use an **Attention Getting Signal**.

3. TEACHER SAY: Raise your hand if you would like to explain how you and your partner solved this problem.

STUDENTS DO: Raise hand to volunteer. Selected partners share problem-solving strategies.

TEACHER DO: Have students write explanations on the board (or write it for them as they explain). Use students' information to model how to write an equation to represent the problem. For example:

$$25+25+25+20 = 95 \quad \text{or} \quad (25 \times 3) + 20 = 95$$

After students explain thinking, have them continue to work with partners to solve the Apply problems. If students are not ready to move on, solve another problem as a whole class. Encourage students to circle the important information in the story problems.

STUDENTS DO: Work with partner to solve multistep story problems.

TEACHER DO: Walk around the room, observing students as they work. Offer assistance where needed and ask students questions about their work, such as:

- How did you know which operation to use?
- Will drawing a picture help you solve the problem?
- What was this question asking?
- Did you reread the problem at the end to make sure you were finding the right information?

Toward the end of Learn, use an **Attention Getting Signal**.

TEACHER SAY: Multistep story problems are a new challenge. Perseverance is important in mathematics because it means you stick with something and do not give up when it becomes difficult. We recorded this on our Thinking Like a Mathematician anchor chart. Please take a moment and put a star by a problem that required the greatest amount of perseverance on your part. Keep your student books out for Reflect.

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: Today we learned how to solve multistep story problems that may involve more than one operation. What strategies did you use to help you figure out how to solve the problems? Turn and Talk to your Shoulder Partner.

STUDENTS DO: Talk to partner about the strategies used.

TEACHER DO: After 1 to 2 minutes, call on several students to share thinking.

TEACHER SAY: Now, share the problem you starred with your partner—the one that required the most amount of perseverance and thought on your part.

TEACHER DO: After 1 to 2 minutes, call on several students to share thinking.

TEACHER SAY: You did a wonderful job showing perseverance today in class. Multistep story problems require you to stop and really think about what the problem is asking. You have to determine what operations to use. You may have to use multiple strategies, including writing equations and drawing pictures. This kind of deep thinking is what real mathematicians do every day and you are all real mathematicians.

Lesson 68 Overview

LESSON OVERVIEW

In today's lesson, students work on error analysis. This computational thinking skill is crucial to help students attend to precision and fully understand what story problems are asking. It also creates an atmosphere that values checking the accuracy of work over the speed of completion.

LEARNING OBJECTIVES

Students will:

- Analyze solutions to two-step story problems to identify and explain the errors made.
- Explain the benefits of error analysis in improving thinking and learning.

KEY VOCABULARY

- Review vocabulary as needed.

MATERIALS

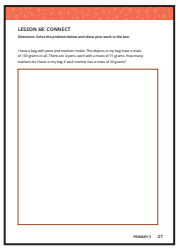
- Thinking Like a Mathematician anchor chart
- Mathematics Student Book and pencil

LESSON PREPARATION FOR THE TEACHER

- Add "I can explain my thinking and try to understand the thinking of others." to the Thinking Like a Mathematician anchor chart.

Connect (10 to 15 minutes)

Directions



1. TEACHER DO: Have students open the Mathematics Student Book to page Lesson 68: Connect and read the story problem silently. Give students 5 to 10 minutes to read and solve the problem. If the problem is too challenging for independent work, they may work with **Shoulder Partners** or as a class.

STUDENTS DO: Open book to the Connect page and read through the story problem. Solve the Connect problem.

TEACHER DO: Call on students to share answers and problem-solving strategies. If time allows, have students show work on the board.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Our learning target today is to analyze incorrect solutions to two-step story problems in order to find the mistakes. Why might finding and correcting mistakes help us learn? Think for a moment and when you have an answer, give me a Thumbs Up.

STUDENTS DO: Think quietly and then give a **Thumbs Up**. Selected students share ideas with the class.

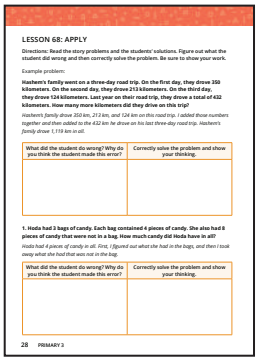
TEACHER DO: Add or confirm the following:

Analyzing mistakes helps us

- persevere in solving problems.
- make sense of problems and problem-solving strategies.
- be precise with our work.
- confirm or correct our understanding.

2. TEACHER SAY: Today you will practice looking at how other students solved problems. You will find where they made mistakes and then solve the problems correctly. I added to our Thinking Like a Mathematician anchor chart: "I can explain my thinking and try to understand the

thinking of others." Today we will be thinking like a mathematician in this way as we find the errors in work and show the correct way to solve the problem.


LESSON 68: APPLY

Directions: Read the story problems and the students' solutions. Figure out what the student did wrong and then correctly solve the problem. Be sure to show your work.

Example problem:

Hashem's family went on a three-day road trip. On the first day, they drove 350 kilometers. On the second day, they drove 213 kilometers. On the third day, they drove 124 kilometers. Last year on their road trip, they drove a total of 432 kilometers. How many more kilometers did they drive on this trip?

Hashem's family drove 350 km, 213 km, and 124 km on this road trip. I added those numbers together and then added to the 432 km he drove on his last three-day road trip. Hashem's family drove 1,119 km in all.

What did the student do wrong? Why do you think the student made this error?	Correctly solve the problem and show your thinking.

1. Hoda had 2 bags of candy. Each bag contained 4 pieces of candy. She also had 8 pieces of candy that were not in a bag. How much candy did Hoda have in all?

Hoda had 4 pieces of candy in all. First, I figured out what she had in the bags, and then I took away what she had that was not in the bag.

What did the student do wrong? Why do you think the student made this error?	Correctly solve the problem and show your thinking.

28 PRIMARY 3

Open up your student book to page Lesson 68: Apply and look at the example problem. Raise your hand if you would like to read the problem to the class.

STUDENTS DO: Turn to the Apply page and read the example problem. Raise hand to volunteer. Selected student reads the problem aloud.

TEACHER DO: Call on another student to read the description of how the student solved the problem. Have students talk to a **Shoulder Partner** about what the student did wrong. Call on several students to share understanding of the student's error (the student added all of the kilometers on both road trips instead of subtracting the mileage of last year's trip from the total mileage of the most recent road trip).

TEACHER SAY: Raise your hand if you can explain why they made this error.

STUDENTS DO: Raise hand to volunteer. Selected students share thinking.

TEACHER DO: Accept any reasonable answers. Then, have students record thinking in the first column under the problem.

STUDENTS DO: Record answers.

3. TEACHER SAY: The second part of this table asks you to correctly solve the problem and show your thinking. Please do so now. When you are finished, compare your work with your Shoulder Partner and see if you have the same answer. If not, see where you disagree and why.

STUDENTS DO: Solve the problem in the second column. Compare work with partner.

TEACHER DO: Ask students to share explanations with the class. If time allows, have students share work on the board.

TEACHER SAY: Please continue working on the problems in your student book. Read each problem and then read the student's solution. Determine where they made errors in thinking or computation. Then, solve the problem yourself. You may check with your Shoulder Partner after you complete each problem to see if you agree. Do you have any questions before you begin?

STUDENTS DO: Ask clarifying questions, if needed. Work independently on the problems. Compare work with **Shoulder Partner**.

TEACHER DO: Walk around, observing students as they work and offering assistance when necessary. Take note of what strategies students are using to solve problems. At the end of Learn, use an **Attention Getting Signal** and transition to Reflect.

Reflect (5 to 10 minutes)

Directions


LESSON 68: MATH JOURNAL

Directions: Reflect on your learning about error analysis. Why is error analysis an important part of mathematics? How can error analysis help you improve your own work?

30 PRIMARY 3

1. TEACHER SAY: Today we focused on finding the errors in someone's work. Why is error analysis such an important part of mathematics? How can finding and fixing errors improve your own work? Please open to page Lesson 68: Math Journal and write your answer in the box provided.

STUDENTS DO: Turn to the Math Journal page and respond to the prompt.

TEACHER DO: Collect students' books to read responses and assess current understanding of the value of error analysis.

TEACHER SAY: Mistakes are learning opportunities. Analyzing and fixing mistakes makes you stronger learners and mathematicians.

Lesson 69 Overview

LESSON OVERVIEW

In this lesson, students are asked to think of more than one strategy to solve two-step story problems. This is a natural way for students to learn to check work in a different way. They will also justify problem-solving strategies to highlight which one works best for themselves. The goal is to help students become flexible thinkers who are able to approach problems from multiple perspectives and to recognize that making and correcting errors is a normal part of learning.

LEARNING OBJECTIVES

Students will:

- Apply multiple strategies to solve two-step story problems.
- Justify problem-solving strategies.

LESSON PREPARATION FOR THE TEACHER

- No additional preparation needed.

KEY VOCABULARY

- Review previously taught vocabulary.

MATERIALS

- Strategies anchor chart from Lesson 65
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

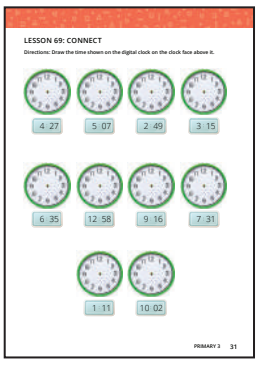
Directions

1. TEACHER SAY: Let's talk about telling time. Please turn to your Shoulder Partner and discuss what you remember about how to tell time.

STUDENTS DO: Tell partner what they know about time.

TEACHER DO: After about 2 minutes, ask students to share ideas with the class. Make sure to review the following:

- Meaning of the hour hand.
- Meaning of the minute hand.
- Each number on the clock represents a group of 5.
- We can tell time by skip counting by 5s or multiplying the number the minute hand is on by 5.
- The marks in between the numbers have a value of 1 minute.


LESSON 69: CONNECT

Directions: Draw the time shown on the digital clock on the clock face above it.

4 27 | 5 07 | 2 49 | 3 15

6 35 | 12 58 | 9 16 | 7 31

1 11 | 10 02

PRIMARY 2 31

2. TEACHER SAY: Take out your Mathematics Student Book and turn to page Lesson 69: Connect. Read the directions to yourself.

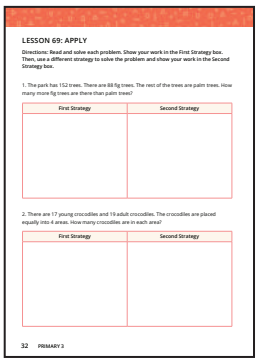
STUDENTS DO: Turn to the Connect page and read the directions silently.

TEACHER DO: Make sure students understand the directions and have them begin working. During the last minute of Connect, ask students to check work with a **Shoulder Partner** and see if they agree on the answers.

Walk around and check students' work as the complete the review and compare answers. This should not be a formal answer check, but a quick determination of who may need additional practice.

Learn (35 to 45 minutes)

Directions


LESSON 69: APPLY

Directions: Read and solve each problem. Show your work in the First Strategy box. Then, use a different strategy to solve the problem and show your work in the Second Strategy box.

1. The park has 152 trees. There are 88 fig trees. The rest of the trees are palm trees. How many more fig trees are there than palm trees?

First Strategy	Second Strategy

2. There are 17 young crocodiles and 19 adult crocodiles. The crocodiles are placed equally into 4 areas. How many crocodiles are in each area?

First Strategy	Second Strategy

32 PRIMARY 3

1. TEACHER SAY: Today's math goal is to apply more than one strategy to solve two-step story problems and to explain why you used your problem-solving strategies. Turn to page Lesson 69: Apply and read the directions.

STUDENTS DO: Turn to the Apply page and read the directions.

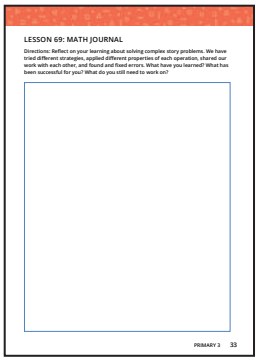
TEACHER DO: Make sure students understand the directions and have them begin working independently to solve the problems. Encourage students to refer to the anchor charts in the room to identify strategies that may work for them.

Monitor students as they work. Check to see if students can independently come up with two strategies to solve a problem. If students are struggling with this concept, they can work with a **Shoulder Partner**. With about 10 minutes left in Learn, use an **Attention Getting Signal**. Have two students who used different problem-solving strategies show work on the board.

TEACHER SAY: Please keep your books out for Reflect.

Reflect (5 to 10 minutes)

Directions


LESSON 69: MATH JOURNAL

Directions: Reflect on your learning about solving complex story problems. We have tried different strategies, applied different properties of each operation, shared our work with each other, and found and fixed errors. What have you learned? What has been successful for you? What do you still need to work on?

PRIMARY 3 33

1. TEACHER SAY: Turn to page Lesson 69: Math Journal in your student book. Read the directions silently.

STUDENTS DO: Turn to the Math Journal page and read the directions.

TEACHER SAY: Today for Reflect, think about what you have learned over the past few lessons about solving complex problems. We have tried different strategies, applied different properties of each operation, shared our work with each other, and found and fixed errors. What have you learned? What has been successful for you? What do you still need to work on? Record your thinking on your Math Journal page.

STUDENTS DO: Reflect on learning and record thinking in the student book.

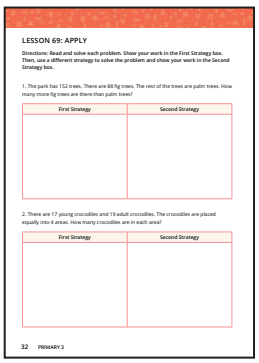
TEACHER DO: Collect student books and review students' self-evaluations. This entry provides valuable information about students' progress in solving complex problems.

Lesson 70 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students review the Associative Property and then create original two-step story problems. This lesson can be scaffolded depending on the needs of the class (see Learn).	Students will: • Write two-step story problems involving any operation. • Solve two-step story problems.	• Associative Property of Multiplication
LESSON PREPARATION FOR THE TEACHER		**MATERIALS**
• No additional preparation needed.		• Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 69: APPLY

Directions: Read and solve each problem. Show your work in the First Strategy box. Then, use a different strategy to solve the problem and show your work in the Second Strategy box.

1. The park has 152 trees. There are 88 fig trees. The rest of the trees are palm trees. How many more fig trees are there than palm trees?

First Strategy | Second Strategy

2. There are 17 young crocodiles and 19 adult crocodiles. The crocodiles are placed equally into 4 areas. How many crocodiles are in each area?

First Strategy | Second Strategy

32 PRIMARY 3

1. TEACHER SAY: Please open your Mathematics Student Book to page Lesson 70: Connect and read the directions silently. I will call on one of you to read them aloud.

STUDENTS DO: Turn to the Connect page in the student book and read the directions. Selected student reads the directions aloud.

TEACHER SAY: Like the story problems that you have worked on, these problems are also two-step. Try the first one and then we will go over the answer as a class.

STUDENTS DO: Solve the first problem in the student book. Selected students share answers and explain thinking.

TEACHER DO: Make sure that students are clear about how to solve the problems. Have students work the next 5 to 7 minutes. At the end of Connect, go over the answers with students. Encourage students to return to their work at a later time to correct errors.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: In our last few math classes, you solved two-step story problems and tried different strategies. Today our goal is to practice writing two-step story problems. Raise your hand if you can think of what might be challenging about writing story problems.

STUDENTS DO: Raise hand to volunteer. Selected students share thinking.

Note to the Teacher: Be sure to address students' concerns. Students may say things like:
- *I am unsure how to start.*
- *I can write a one-step problem but not a two-step problem.*
- *What types of equations should I use?*

The following are some ways to differentiate instruction for this lesson:
- *Provide numeric equations for students to use to create original problems.*
- *Suggest students focus on the first step before thinking about and writing the second.*
- *Use story problems they have previously solved as models.*
- **Model** *several strategies for the students. If needed, use the section below. If not, have students begin working.*

TEACHER SAY: One way I can write a two-step story problem is by breaking it into parts. Watch as I Model my thinking for you.

TEACHER DO: Write the following problem on the board while speaking:

_____ (Name of a student in class) and _____ (name of a different student in class) are having a snack. _____ (first student) bought 2 oranges. _____ (second student) bought 3 apples.

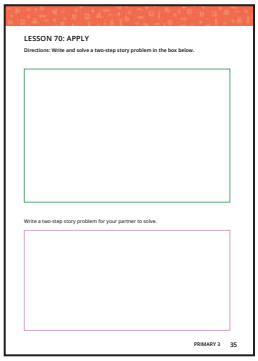
TEACHER SAY: I think I want the students to put their fruit together. If I stopped my problem here, how many pieces of fruit would there be for the snack? Whisper the answer into your hand.

STUDENTS DO: Whisper answers into hands.

TEACHER SAY: There would be 5 pieces of fruit. But that is only a one-step problem. Now, I am going to add my second step. Let's pause for a moment. Turn and Talk to your Shoulder Partner about what I could write next.

STUDENTS DO: Talk to partner about ideas for the second step in the problem.

TEACHER DO: Call on several students to share. If possible, use a student suggestion for the second step. If students are struggling to come up with ideas, continue with the following suggestion:


LESSON 70: APPLY

Directions: Write and solve a two-step story problem in the box below.

Write a two-step story problem for your partner to solve.

PRIMARY 1 35

TEACHER SAY: If they cut each piece of fruit into 4 slices, how many fruit slices will they have in all?

STUDENTS DO: Solve the problem. Selected students share answers.

TEACHER DO: Call on students to share answers.

2. TEACHER DO: Have students turn to page Lesson 70: Apply. Make sure students understand the directions and have them begin working. As students work, walk around the room and help them as needed. Use the last 15 minutes of Learn to have students **Hands Up Pair Up** and solve their partner's story problem. Collect books at the end of Learn and read them to see if students are able to meet this learning goal.

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: You did a great job today creating your own multistep story problems. It is challenging to create good story problems, but you persevered. Reflect on what is challenging about writing your own story problems. How can writing multistep story problems help you get better at solving them? Share your thinking with your Shoulder Partner. I will use Calling Sticks to select several of you to share your thinking.

STUDENTS DO: Talk to partner about the learning benefits of writing multistep story problems. Selected students share thinking with the class.

TEACHER SAY: Writing your own story problems can be challenging. It requires you to think about each step and what information is being asked. Great job today with this challenge.

PRIMARY 3

Mathematics

HOW THE WORLD WORKS

ORIGINS

Chapter 2

Lessons 71 to 80

Chapter 2: Lessons 71 to 80

Students explore and learn about fractions in this chapter. There is a strong focus on unit fractions, where 1 is the numerator, as a way to understand a part of the whole. In addition to multiplication, the fraction theme is a major one for Primary 3. Students examine concepts such as what a fraction is, as both parts of a set and parts of a whole; how to read and write fractions; what a unit fraction is and what it represents; how to write a whole as a fraction; and the important notion that the size of the whole matters when comparing fractions. In order to develop a deep understanding of fractions, students create fraction kits. During subsequent lessons and chapters, students use this tool as a resource for building conceptual understanding.

COMPONENT	DESCRIPTION	LESSONS
 Connect	During this daily routine, students build fluency in previously learned skills, make connections between prior learning and the upcoming Learn segment, and discuss mathematics concepts. Students may be introduced to an engaging, real-world math problem that establishes a purpose for learning a new skill or concept.	10 to 15 minutes
 Learn	During this daily routine, students learn and apply various math skills and concepts. Students engage in exploration, experimentation, problem-solving, collaboration, and discussion to build understanding and application of new skills and concepts and make connections to prior learning. Students learn to think and work like mathematicians and persevere in developing foundational understanding of challenging skills and concepts.	35 to 45 minutes
 Reflect	During this daily routine, students develop the ability to express mathematical ideas by talking about discoveries, using math vocabulary, asking questions to make sense of learning tasks, clarifying misconceptions, and learning to see things from peers' perspectives.	5 to 10 minutes

Learning Indicators

Throughout Lessons 71 to 80, students will work toward the following learning indicators:

C. NUMBERS AND OPERATIONS IN BASE TEN:

3.a. Describe a proper fraction $1/b$ as the quantity formed by 1 part when a whole is partitioned into b equal parts.
3.b. Read and write proper fractions.
3.e. Demonstrate understanding that the proper fraction b/b is equal to one whole.
3.h. Demonstrate understanding that comparisons of fractions are valid only if the wholes are the same.
3.i. Compare two fractions with the same numerator or the same denominator by reasoning about their size using a number line or concrete models.

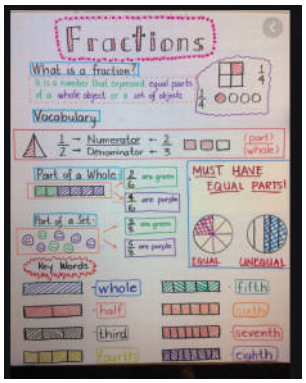
CH 2 Pacing Guide

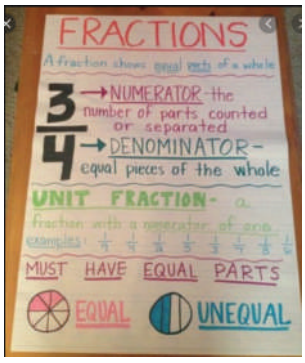
LESSON	INSTRUCTIONAL FOCUS
71	Students will: • Investigate the relationship between parts and wholes in fractions. • Define the word "fraction" in relation to parts and wholes.
72	Students will: • Create models to represent fractions. • Describe one part of a whole using fraction vocabulary. • Define unit fraction.
73	Students will: • Discuss fraction terms numerator, denominator, and unit fraction. • Reason with fractions in real-life applications using models. • Write a fraction story problem using models.
74	Students will: • Compare different unit fractional parts of the same whole using models. • Explain the relationship between the size of the denominator and the size of the fraction as it relates to the whole.
75	Students will: • Identify unit fractions of a set. • Expand original definitions of fraction.
76	Students will: • Explain why the size of the whole matters when comparing two unit fractions.
77	Students will: • Write one whole as a fraction. • Explain how to write one whole as a fraction.
78	Students will: • Investigate the relationship between fractions and division using models.
79	Students will: • Divide a set into equal parts. • Determine the quantity in each fractional part of a set. • Explain the relationship between fractions and division.
80	Students will: • Reason with fractions in real-life applications.

Chapter Preparation for Teacher

For Lesson 71:

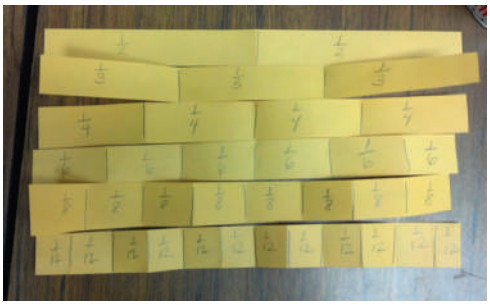
- Prepare a new Fractions anchor chart. For now, just have a large chart paper with the title Fractions. The chart content will be added throughout the fraction lessons. Two examples are shown below, but create a chart that works for you and your class as you work through the lessons.





For Lesson 72:

- Gather envelopes or baggies for students to use to store fraction models.
- Print one set of the Fraction Model – Teacher Strips Blackline Master.
  - Alternatively, create a larger teacher model using construction paper.
- Have scissors and colored pencils or crayons available.
- Cut out four squares using construction paper or other colored paper. The squares should be large enough for all students to see (at least 15 cm × 15 cm).
- Consider printing extra sets of Fraction Model—Student Strips Blackline Master for students who make uncorrectable errors with fraction models.



For Lesson 75:

- Prior to the lesson, gather one object that has a mass of 1 gram (for example, a paper clip, raisin, or 1 LE bill) and one object that has a mass of 1 kilogram (for example, a medium melon or a bag of rice).
- Prior to the lesson, consider how you might divide students into sets of 2, 3, 4, 6, or 8 in order to have students consider fractions of those sets. For example, for a group of 6 students, you might ask, "What fraction of the group is wearing a red shirt?"

For Lesson 76:

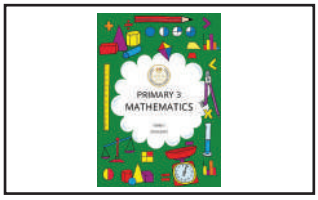
- Gather a collection of pairs of objects that are the same but are different sizes. For example, a large bottle of water and a small bottle of water; a large circle and a small circle; a large book and a small book; and so on. For at least one of the pairs, have two sets of different sizes. For example, a set of 20 marbles and a set of 10 marbles.
  - The items can be drawings or actual objects.
  - Students will compare the size of these objects to build understanding that the size of the whole affects the size of the unit fraction.

For Lesson 78:

- Prepare a set of 24 counters for each student.

Materials Used

Student book



Pencils

Colored pencils or crayons

Four squares of construction paper

Scissors

Sets of 24 counters (one set per student)

Envelopes or bags to store fraction models

Collections of objects to compare wholes and fractions

Fraction strips and/or circles

Thinking Like a Mathematician anchor chart

Fraction Model—Teacher Strips (one set for the teacher)

Fractions anchor chart

Lesson 71 Overview

LESSON OVERVIEW

In this lesson, students begin looking at equal shares as an introduction to fractions. They review what they remember from Primary 2 and build on that to identify a variety of fractions ($\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{6}$, $\frac{1}{8}$) and draw equal parts. The main goal of this lesson (besides review) is for students to understand that fractions are equal parts of a whole. In Reflect, students express initial understandings of "fraction" by writing a first draft definition of the term.

LEARNING OBJECTIVES

Students will:

- Investigate the relationship between parts and wholes in fractions.
- Define the word "fraction" in relation to parts and wholes.

LESSON PREPARATION FOR THE TEACHER

Display Fractions anchor chart on the board. (The chart will have only a title for now.)

KEY VOCABULARY

- Eighths
- Equal parts
- Fair shares
- Fourths
- Fraction
- Halves
- Thirds
- Whole

MATERIALS

- Fractions anchor chart
- Mathematics Student Book and pencil

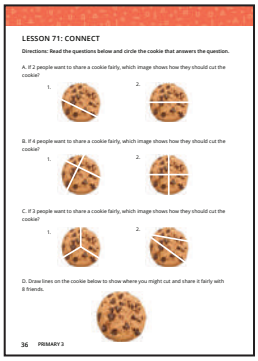
Connect (10 to 15 minutes)

Directions

1. TEACHER SAY: Think of a recent time where you were sharing something with someone. What were you sharing? When you shared, was it fair? What makes it "fair" when you share with someone? I will use Calling Sticks to hear from a few of you.

TEACHER DO: Choose three or four students to tell the group what they shared and if it was fair. How did they know?

STUDENTS DO: Selected students share thinking with the group.


LESSON 71: CONNECT

Directions: Read the questions below and circle the cookie that answers the question.

A. If 2 people want to share a cookie fairly, which image shows how they should cut the cookie?

1. 2.

B. If 4 people want to share a cookie fairly, which image shows how they should cut the cookie?

1. 2.

C. If 3 people want to share a cookie fairly, which image shows how they should cut the cookie?

1. 2.

D. Draw lines on the cookie below to show where you might cut and share it fairly with 8 friends.

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TEACHER DO: Have students turn to page Lesson 71: Connect in the Mathematics Student Book. Make sure students understand the directions and then have them begin working. When finished, they should check thinking with a **Shoulder Partner**.

STUDENTS DO: Turn to the Connect page. Work independently to solve the problems and then check work with a **Shoulder Partner**.

TEACHER DO: Give students 1 to 2 minutes to complete and check with partner. When most are finished, bring the group back together.

2. TEACHER SAY: How did you decide which cookies were shared fairly? Raise your hand to share.

STUDENTS DO: Raise hand and share.

Note to the Teacher: Students should note that only those cookies that were shared equally were shared fairly.

TEACHER SAY: The cookies that were shared fairly gave each person an equal amount. Today we are going to explore the idea of fair shares, or equal parts. Please keep your book open for Learn.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today's learning goal is to build our understanding of fractions and the relationship between parts and wholes in fractions. On the board, I have started a new Fractions anchor chart to help us keep track of what we already know as well as new learning. Turn to your Shoulder Partner and discuss anything you might remember about fractions from Primary 2. What is a fraction? Can you think of an example of a fraction? How do you write a fraction? Give me a Thumbs Up when ready to share.

STUDENTS DO: Turn and discuss background knowledge of fractions. Give a **Thumbs Up** to volunteer. Selected students share thinking about fractions.

Note to the Teacher: Students learned about $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$ in Primary 2.

TEACHER DO: Record students' thinking on the board (not the chart).

Students might share:

- Fractions are parts of a whole.
- Examples such as $\frac{1}{2}$ of a sandwich or a circle.
- Examples of $\frac{1}{4}$ such as breaking something up into four parts.
- Drawings of fractions (allow students to come up and show on the board). If necessary, guide those students to explain how they know the image shows halves or thirds.

2. TEACHER SAY: You remembered a lot from Primary 2. Look at the first Connect problem again. If you think cookie 1 shows fractions, hold up one finger. If you think cookie 2 shows fractions, hold up two fingers. I will ask some of you to explain your thinking.

STUDENTS DO: Use fingers to show a response. Selected students explain thinking to justify an answer.

TEACHER DO: Repeat for problems B and C.

TEACHER SAY: These cookies represent one whole, and the cookies that are divided up into equal parts represent fractions. These cookies show halves, thirds, and fourths. What about the cookie you divided in problem D? How many equal parts did you break up the whole into? Whisper into your hand.

STUDENTS DO: Whisper answers into hands.

TEACHER SAY: You created eight equal parts, so this cookie is broken up into eighths. When we use fractional vocabulary, we often add the sound "ths" to the end. Say "eighths" in your hand.

STUDENTS DO: Say: eighths.

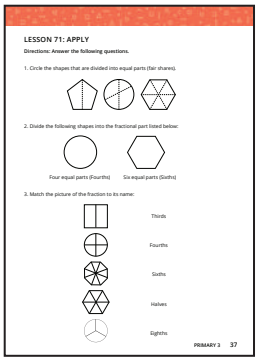
TEACHER SAY: Who would like to predict what fractional word we use when we divide something into six equal parts?

STUDENTS DO: Raise hand to volunteer. Selected students share answer.

TEACHER DO: Confirm "sixths" as the correct answer. Repeat a few examples like this (such as fifths, sevenths, twelfths, and so on). The goal is for students to learn fractional language. They will apply this understanding later when they name proper fractions.

TEACHER SAY: Can you think of an example where we do not use the "ths" sound to name fractions?

STUDENTS DO: Raise hand to share answer.


LESSON 71: APPLY

Directions: Answer the following questions.

1. Circle the shapes that are divided into equal parts (fair shares).

2. Divide the following shapes into the fractional part listed below:

Four equal parts (Fourths) Six equal parts (Sixths)

3. Match the picture of the fraction to its name:

Thirds

Fourths

Sixths

Halves

Eighths

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3. TEACHER DO: Confirm halves and thirds as correct. Have students turn to page Lesson 71: Apply and read the directions silently.

STUDENTS DO: Turn to the Apply page and read the directions to themselves.

TEACHER DO: Make sure students understand the directions for the Apply activity. Encourage students who finish early to try the Challenge problem.

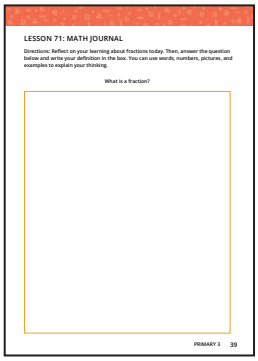
STUDENTS DO: Ask clarifying questions, if necessary. Work independently to complete the Apply problems. Students who finish early can work on the Challenge problem.

TEACHER DO: Walk around as students are working and identify students who need additional support. If possible, work with those students in a small group to help them complete the Apply activity.

TEACHER SAY: **Please keep your student books out for Reflect.**

Reflect (5 to 10 minutes)

Directions


LESSON 71: MATH JOURNAL

Directions: Reflect on your learning about fractions today. Then, answer the question below and write your definition in the box. You can use words, numbers, pictures, and examples to explain your thinking.

What is a fraction?

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1. TEACHER SAY: **Turn to page Lesson 71: Math Journal and read the prompt.**

STUDENTS DO: Turn to the journal page and read the prompt silently.

TEACHER SAY: **In the space provided, write a definition of a fraction. You can draw examples as well as use words.**

TEACHER DO: Give students 2 to 3 minutes to record thinking. Then, call on volunteers to share definitions. As a class, craft a definition together. Write the class' definition on the anchor chart. This definition will be expanded later as more fraction language is discussed, but for now be sure the definition includes that fractions are part of a whole and that each part is equal in size.

TEACHER SAY: **Great job. We are going to keep this definition posted on our anchor chart and add more to it in the coming days as we continue to learn more about fractions. Put away your books for today.**

Lesson 72 Overview

LESSON OVERVIEW

In today's lesson, students examine two different visual representations of halves to challenge understandings of fractions. Students then create a set of fraction models (strips) to build a solid conceptual understanding of $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{6}$, and $\frac{1}{8}$. These fraction models will be used throughout the fraction lessons in this chapter and the next as a visual reference to help students understand unit fractions, compare fractions, find equivalent fractions, and even add and subtract fractions. Taking the time to build these hands-on models is important and helps students understand relationships between parts and wholes.

LEARNING OBJECTIVES

Students will:

- Create models to represent fractions.
- Describe one part of a whole using fraction vocabulary.
- Define unit fraction.

LESSON PREPARATION FOR THE TEACHER

- Gather envelopes or baggies for students to use to store fraction models.
- Print one set of the Fraction Model—Teacher Strips Blackline Master.
  - Alternatively, create a larger teacher model using construction paper.
- Have scissors and colored pencils or crayons available.
- Cut out four squares using construction paper or other colored paper. The squares should be large enough for all students to see (at least 15 cm × 15 cm).
- Optional: Print a few extra Fraction Model—Student Strips Blackline Masters for students who make uncorrectable errors in coloring or cutting.

KEY VOCABULARY

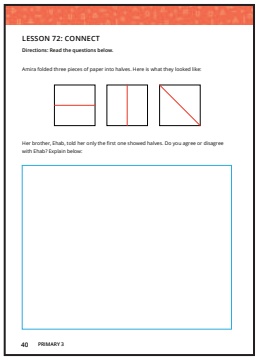
- Denominator
- Numerator
- Unit fraction
- Review previous fraction vocabulary as needed.

MATERIALS

- Fractions anchor chart
- Four squares of construction paper
- Envelopes or bags to store fraction models
- Optional: Extra fraction models
- Fraction Model—Teacher Strips (one set for the teacher)
- Colored pencils or crayons
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 72: CONNECT

Directions: Read the questions below.

Amira folded three pieces of paper into halves. Here is what they looked like:

Her brother, Ehab, told her only the first one showed halves. Do you agree or disagree with Ehab? Explain below:

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1. TEACHER SAY: Yesterday we reviewed fractions and wrote a definition of fractions on our chart. Please open your Mathematics Student Book to page Lesson 72: Connect. Read the problem and decide if you agree or disagree with Ehab. Record your thinking. After a few minutes, I will call on some of you.

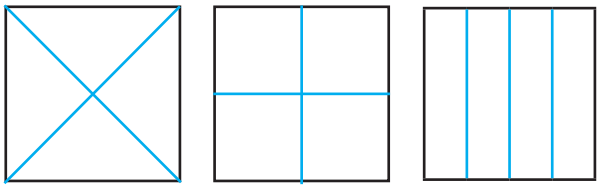
STUDENTS DO: Open book to the Connect page, read the problem, and answer the question. Selected students share thinking with the class.

TEACHER DO: If possible, be sure to call on both students who agree and disagree with Ehab and ask them to explain their thinking. Confirm for students that all of the shapes are examples of halves. Hold up one large square.

TEACHER SAY: Can someone think of a way for me to fold this piece of paper into four equal parts? Raise your hand to come up and model.

STUDENTS DO: Raise hand to volunteer. Selected student models how to fold the square into fourths.

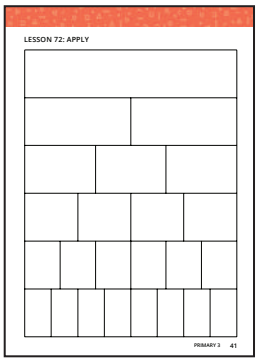
TEACHER DO: When the first student is finished, call on another student to fold the square into fourths a different way. Discuss and repeat once more. Examples of folds might include:



TEACHER SAY: **Since all of these pieces of paper have been folded into four equal parts, they all show fourths. Today we are going to create our own set of fraction models to help us learn more about fractions.**

Learn (35 to 45 minutes)

Directions



1. TEACHER DO: Display your large model of the fraction bars. Have students turn to page Lesson 72: Apply and take out scissors and colored pencils or crayons.

STUDENTS DO: Turn to page Lesson 72: Apply and take out materials.

TEACHER SAY: **Our learning goal is to create a set of fraction models to help us better understand the relationship between fractions and understand what a unit fraction is. Look at the bar at the top of the page. That bar is not divided into parts. It is one whole. Write the number 1 on that bar.**

STUDENTS DO: Write 1 on the first bar.

TEACHER SAY: **Look at the next bar. What do you notice about that bar? Raise your hand to share your thinking.**

STUDENTS DO: Examine the second bar and raise hand to volunteer. Selected students share thinking.

Note to the Teacher: Students should notice that the bar is divided into two equal pieces, and that the total length of the bar is equal to the one whole bar. If they do not make these observations, ask questions to prompt extended thinking.

TEACHER SAY: **This bar has two equal parts. What does one of these parts represent? Raise your hand if you know.**

TEACHER DO: Use your large fraction model to point to the whole bar and one of the $\frac{1}{2}$ parts.

STUDENTS DO: Raise hand to volunteer. Selected students share thinking. One student will write $\frac{1}{2}$ on the board.

TEACHER DO: Confirm that each bar represents one-half of the whole bar and that the student has written the fraction correctly on the board.

TEACHER SAY: **What does the 2 represent? What does the 1 represent? Raise your hand to share your thinking.**

STUDENTS DO: Raise hand to volunteer. Selected students explain understanding.

2. TEACHER DO: Confirm or correct students' thinking about the meaning of the 2 and the 1 in the fraction $\frac{1}{2}$. Then, write the words NUMERATOR and DENOMINATOR on the board next to $\frac{1}{2}$. Guide discussion to record the definitions. Example:

1–Numerator: Top part of a fraction. Shows how many parts we have.
2–Denominator: Bottom part of a fraction. Shows how many parts there are in all.

Have students repeat the words. Record the words and definitions on anchor chart.

TEACHER SAY: These are two very important fraction words. We will use them often, so be sure to ask questions if you do not understand what they mean. On your strip, label each of the two halves.

TEACHER DO: Model labeling your large fraction model as shown below:

STUDENTS DO: Observe teacher modeling and then label fraction bars.

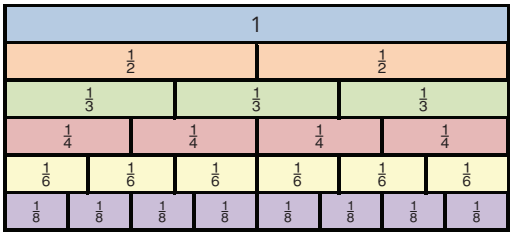
TEACHER SAY: This fraction shows the bar divided into two equal parts. One part represents one-half of the whole bar. Mathematicians call fractions with a 1 as the numerator UNIT FRACTIONS because they represent one unit, or one part of the whole.

TEACHER DO: Repeat for the remaining bars— $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{6}$, and $\frac{1}{8}$. Check to make sure students have labeled fraction bars correctly. They will be unable to make corrections after the next step.

STUDENTS DO: Label each bar on the fraction model. Make corrections to fraction model, if necessary.

TEACHER DO: After students have labeled the bars, have them color each bar a different color. Be sure they understand that the two halves should be the same color, the three thirds should be the same color, and so on. Caution students to color lightly so they can still read the labels.

A completed fraction model should look something like this:



STUDENTS DO: Color the fraction models in the student book.

3. TEACHER DO: When students have finished coloring, direct them to carefully cut apart the fraction models. They should cut only on the solid lines to ensure that the models are accurate. When finished, they should have 2 $\frac{1}{2}$ pieces, 3 $\frac{1}{3}$ pieces, and so on.

Direct students to write their names or initials on the back of each model.

Distribute envelopes or baggies to students for storage. Direct students to write their names on the envelopes or baggies. Either collect the materials or have students store them at the tables.

STUDENTS DO: Cut apart fraction models. Write names or initials on the back of each model. Write names on the envelope or baggie. Store completed fraction models and either hand them to the teacher or store them at tables for the next lesson.

TEACHER SAY: Put all of your materials away for Reflect.

STUDENTS DO: Put away scissors and coloring materials.

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: Today we made fraction sets for a whole, halves, thirds, fourths, sixths, and eighths, and we discussed unit fractions. For Reflect, I would like to hear something new you noticed or learned about fractions as you were working with your models. I will give you 1 minute to think and then give me a Thumbs Up if you would like to share first. We will Popcorn to hear from as many of you as possible.

STUDENTS DO: Reflect quietly for 1 minute. Give a **Thumbs Up** to share when ready. **Popcorn** to the next student to share. Selected students share new observations or learning.

TEACHER DO: At the end of the lesson, congratulate students on a job well done. Remind them that they will use the new models in the next lesson.

Lesson 73 Overview

LESSON OVERVIEW

In this lesson, students begin by dividing clocks into fractional parts and discussing the minutes in each part as a review of time and fractions. This activity helps them continue to make connections between math concepts that do not seem connected at first glance.

In Learn, students use fraction models to discuss fraction vocabulary (denominator, numerator, and unit fractions) and solve problems involving fractions. Critical concepts include: fractions represent equal parts of a whole; fractions have specific names that help us understand how much of the whole they represent; the numerator and the denominator form the name of a fraction; and fractions that represent one part of the whole are called unit fractions. This conceptual understanding will solidify with the use of fraction models. In Reflect, students choose a fraction from the models and write a story problem that fits the fraction to demonstrate understanding of that fraction.

LEARNING OBJECTIVES

Students will:

- Discuss fractions terms numerator, denominator, and unit fraction.
- Reason with fractions in real-life applications using models.
- Write a fraction story problem using models.

LESSON PREPARATION FOR THE TEACHER

- Display Fractions anchor chart and Thinking Like a Mathematician anchor chart.
- Prior to the lesson, draw three clock faces on the board.

KEY VOCABULARY

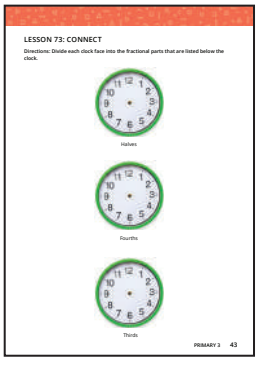
Review fraction vocabulary as needed.

MATERIALS

- Fractions anchor chart
- Thinking Like a Mathematician anchor chart
- Students' strip fraction models (created in Lesson 72)
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 73: CONNECT

Directions: Divide each clock face into the fractional parts that are listed below the clock.

Halves

Fourths

Thirds

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1. TEACHER DO: Have students open the Mathematics Student Book to page Lesson 73: Connect and read the directions silently. Then, have students work with a **Shoulder Partner** to complete the activity. Have students give you a signal when they are finished.

STUDENTS DO: Turn to the Connect page. Work with a partner to complete the activity. Give the teacher a signal when they are finished.

TEACHER DO: As students work, walk around to take note of students who divide the clock in half by drawing a line from 12 to 6. You will want to call on one of those students to share work. After 2 to 3 minutes, continue the lesson.

2. TEACHER SAY: Clock faces are circles and can be divided into fractional parts, just like the cookies we divided a couple of lessons ago. Who can remind us how many minutes are in one hour, or one rotation of the minute hand around the circle, and which hand tells the minutes?

STUDENTS DO: Raise hand to volunteer. Selected students share answers.

TEACHER SAY: Great. Now who would like to come up and show how to divide the first clock into halves?

STUDENTS DO: Selected student goes to the front and shows one way to divide the clock into halves.

Note to the Teacher: If the student does not draw a line from 12 to 6, draw another clock and ask students if they divided the clock another way. Call on a student who divided the clock from 12 to 6. Then, continue with the lesson.

TEACHER SAY: I am going to color in one-half of the clock. Lean and Whisper how many minutes are colored.

STUDENTS DO: Whisper answers.

TEACHER SAY: Yes, one-half of the clock has 30 minutes. Half of 60 is 30. 30 + 30 = 60. When the minute hand has gone halfway around the clock, it is pointing to the 6, and 30 minutes have passed.

TEACHER DO: Repeat the process, having students come up and show how they divided the clock into fourths and thirds. Each time, color in one part and ask how many minutes are colored. Record equations on the board as you did for 30 + 30 = 60.

Note to the Teacher: This activity may be challenging for some students, but it is a great way to review time and provide a different fraction visual that is connected to the real world. The activity also helps students make a connection between fractions and fractions of time as demonstrated in the terms half past, a quarter past, and a quarter to.

TEACHER SAY: Good work. Fractional parts are all around us. Today we will use our fraction models to help us solve problems.

Learn (35 to 45 minutes)

Directions

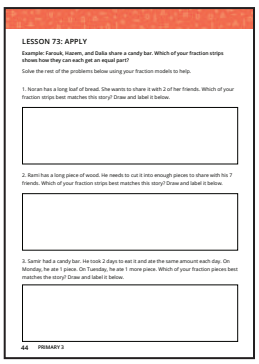
Note to the Teacher: If students did not finish making fraction models in Lesson 72, allow time for this before the lesson. If this is the case, you may need to shorten the lesson.

1. TEACHER DO: Hand out fraction models to students (or have them take them out). Write the fraction $\frac{1}{8}$ on the board.

TEACHER SAY: Today our goal is to use our fraction models to solve problems. In our last class, we labeled our fraction models. Each fraction had two numbers, a top number and a bottom number. We also discussed unit fractions. Turn to your Shoulder Partner and discuss these words: numerator, denominator, and unit fraction. Give me a Thumbs Up when you are ready to discuss what these terms mean.

STUDENTS DO: Talk to partner about the vocabulary words and give a **Thumbs Up** when ready to share. Selected students share definitions of numerator, denominator, and unit fraction (a fraction that has a 1 as the numerator and any number greater than 1 as the denominator).

TEACHER DO: Encourage students to use the fraction you wrote on the board to help explain their thinking. Have students label the numerator and denominator. Have students provide examples of unit fractions (other than $\frac{1}{8}$) and draw an example that illustrates its meaning.


LESSON 73: APPLY

Example: Farouk, Haseem, and Dalila share a candy bar. Which of your fraction strips shows how they can each get an equal part?

Solve the rest of the problems below using your fraction models to help.

1. Noran has a long loaf of bread. She wants to share it with 2 of her friends. Which of your fraction strips best matches this story? Draw and label it below.

2. Rami has a long piece of wood. He needs to cut it into enough pieces to share with his 7 friends. Which of your fraction strips best matches this story? Draw and label it below.

3. Samir had a candy bar. He took 2 days to eat it and ate the same amount each day. On Monday, he ate 1 piece. On Tuesday, he ate 1 more piece. Which of your fraction pieces best matches the story? Draw and label it below.

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Then, record an example and definition of unit fraction on the Fractions anchor chart.

2. TEACHER SAY: Today we are going to use our models to explore different fractions and solve some problems involving fractions. Please open your student book to page Lesson 73: Apply. You will see an example problem.

TEACHER DO: Select a student to read the problem aloud to the class.

TEACHER SAY: Hold up the fraction strip that shows how each person can get an equal part.

STUDENTS DO: Hold up a strip that represents answers.

TEACHER SAY: What fraction of the bar did Dalia get?

TEACHER DO: Use **Calling Sticks** to select students to answer the question until the correct answer is identified.

TEACHER SAY: There are 3 people, and they each get an equal part, so the strip that shows thirds is correct. Dalia ate $\frac{1}{3}$ of the bar.

TEACHER DO: Point to the Thinking Like a Mathematician anchor chart.

3. TEACHER SAY: Remember that mathematicians use models to help them understand problems. Our fraction models can help us do just that. Now, it is your turn to work independently to solve the rest of the problems in your student book. If you finish early, try the Challenge problems.

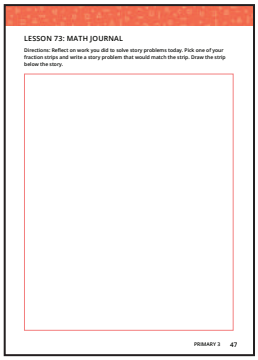
STUDENTS DO: Work independently to solve fraction problems using models. Students who finish early can work on the Challenge problems.

TEACHER DO: Walk around the class, observing students as they work. Offer assistance to students who are struggling and note who might need extra support. Ask students to justify answers using the fraction models.

TEACHER SAY: Nice work solving fraction problems. Keep out your student books for Reflect.

Reflect (5 to 10 minutes)

Directions


LESSON 73: MATH JOURNAL

Directions: Reflect on work you did to solve story problems today. Pick one of your fraction strips and write a story problem that would match the strip. Draw the strip below the story.

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1. TEACHER SAY: Today you used your fraction models to solve story problems. Please open your student book to page Lesson 73: Math Journal and write a story problem for one of your fraction strips.

STUDENTS DO: Open student book to the journal page and write a story problem that fits one of the fraction strip models.

TEACHER DO: Give students time to write a story. Collect student books at the end to check for understanding. Take note of students who may need additional instruction and support with foundational fraction concepts.

Lesson 74 Overview

LESSON OVERVIEW

This lesson begins with an error analysis problem related to unit fractions. Analyzing errors helps students identify and correct gaps in understanding. In Learn, students are presented with an Essential Question and use fraction models to compare unit fractions. They also use models to explain why, given the same size whole, a larger denominator indicates a smaller fraction of the whole. In Reflect, they answer the Essential Question that was posed at the beginning of Learn.

LEARNING OBJECTIVES

Students will:

- Compare different unit fractional parts of the same whole using models.
- Explain the relationship between the size of the denominator and the size of the fraction as it relates to the whole.

LESSON PREPARATION FOR THE TEACHER

Prior to the lesson, write the following Essential Question on the board:

- What is the relationship between the size of the denominator and the size of the fractional piece as it relates to the whole?

KEY VOCABULARY

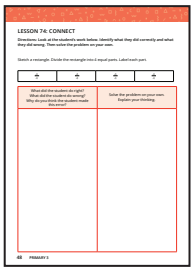
- Greater than
- Less than
- Unit fractions
- Review previous fraction vocabulary as needed.

MATERIALS

- Thinking Like a Mathematician anchor chart
- Strip fraction models (teacher set and student sets)
- Scissors
- Colored pencils or crayons
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 74: CONNECT

1. TEACHER SAY: Please open your Mathematics Student Book to page Lesson 74: Connect. On this page, there is an error analysis problem. Read the problem and see if you can figure out what the student did correctly as well as what they did wrong and why they made this error. Then solve the problem yourself.

STUDENTS DO: Turn to the Connect page. Work independently to complete the activity.

TEACHER DO: Give students 3 to 5 minutes to work on the problem. The problem illustrates a common error that students make when working with fractions. It is important that students attend to what the question is asking. Near the end of Connect, allow students to discuss the student's error and how they corrected it.

Learn (35 to 45 minutes)

Directions

1. TEACHER DO: Distribute strip fraction model sets (or have students take them out).

TEACHER SAY: Today our learning goal is to compare unit fractions of the same size whole and answer this Essential Question: What is the relationship between the size of the denominator and the size of the fractional piece as it relates to the whole?

We have had Essential Questions before. Remember, they help guide our learning. At the end of the lesson, we will circle back and see if we have an answer to this question. Before we begin today, who can remind us what a unit fraction is? Raise your hand.

STUDENTS DO: Raise hand to volunteer. Selected students share definitions.

TEACHER SAY: A unit fraction is a fraction that has 1 as a numerator. In our fraction models, it is one of the pieces in a strip of fractions. In Connect, we saw that the student's error was in labeling the unit fractions incorrectly. Take out your fraction strips. Look at the different fractions and take a minute to arrange the strips in order from the largest fraction strips to the smallest fraction strips. When done, turn and talk to your Shoulder Partner about what you notice.

STUDENTS DO: Place strips in order from largest strips to the smallest strips. Compare work with a partner and discuss observations.

TEACHER DO: Wait 3 to 4 minutes for students to order the strips and discuss observations with partner. Use **Calling Sticks** to select students to arrange your large fraction strips on the board. Then, call on students to share observations. Some observations might include:

- Eighths are the smallest even though the number 8 is the biggest.
- When the whole is divided into more units, each unit is smaller.
- Halves are the biggest fractional part. The whole was only divided into 2 pieces.

2. TEACHER SAY: Interesting observations. Look at $\frac{1}{2}$ and $\frac{1}{3}$. Which unit fraction is larger? How do you know? Turn and Talk to your partner. Give me a Thumbs Up when you are ready to share your thinking.

STUDENTS DO: Share thinking with partner. Give a **Thumbs Up** when they are ready to share. Selected students share reasoning.

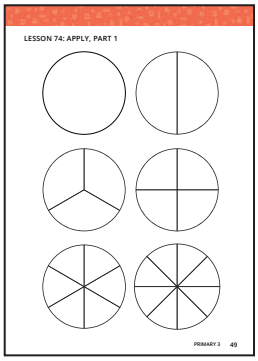
Note to the Teacher: Students should recognize that $\frac{1}{2}$ is greater than $\frac{1}{3}$. Reasons may include:

- *The $\frac{1}{2}$ strip is larger than the $\frac{1}{3}$ strip.*
- *When you split something between two people, the pieces are larger than if you split it between three people.*
- *The whole is cut into fewer pieces, so the pieces are larger.*

TEACHER DO: If necessary, continue with other examples using the fraction strips. If students seem to understand the concept, move on.

3. TEACHER SAY: How do we work with fractions when we are not using fraction strips? What if we are talking about something round, like a pizza? Is $\frac{1}{2}$ still larger than $\frac{1}{3}$? Turn and Talk to your partner about why or why not. Give me a Thumbs Up if you think it still is, a thumbs down if you think it is not. Put your thumb sideways if you are not sure.

STUDENTS DO: Show thinking using **Thumbs Up**.


LESSON 74: APPLY, PART 1

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TEACHER SAY: Let's make a new fraction model and see what happens. Turn to page Lesson 74: Apply, Part 1 in your student book.

STUDENTS DO: Turn to the Apply page.

TEACHER DO: As you did with the fraction strips, work with students to identify and label the unit fractions. Students should color the fraction models using a different color for each denominator and then cut apart the models.

STUDENTS DO: Work with the teacher to create a set of circle fraction models. Write names or initials on the back of each piece.

TEACHER DO: As students work, ask them to describe what is happening to the shapes they are cutting as the denominators get larger. Students should note that the pieces are getting smaller as the denominators get larger.

TEACHER SAY: Look at $\frac{1}{2}$ and $\frac{1}{3}$. Is $\frac{1}{2}$ still larger than $\frac{1}{3}$? Call out.

STUDENTS DO: Call out answers.

TEACHER SAY: **We can use symbols to compare the two fractions.**

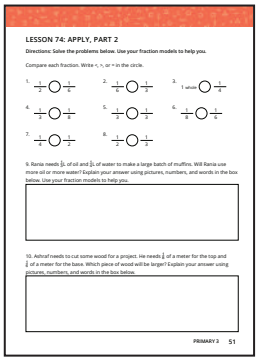
TEACHER DO: Write $\frac{1}{2} > \frac{1}{3}$ on the board.

TEACHER SAY: **Hold up the unit fraction that is the largest.**

STUDENTS DO: Hold up $\frac{1}{2}$.

TEACHER SAY: **Hold up the unit fraction that is the smallest.**

STUDENTS DO: Hold up $\frac{1}{8}$.


LESSON 74: APPLY, PART 2

Directions: Solve the problems below. Use your fraction models to help you.

Compare each fraction. Write <, >, or = in the circle.

1. $\frac{1}{4} \bigcirc \frac{1}{4}$ 2. $\frac{1}{6} \bigcirc \frac{1}{3}$ 3. 1 whole $\bigcirc \frac{1}{2}$

4. $\frac{1}{3} \bigcirc \frac{1}{3}$ 5. $\frac{1}{2} \bigcirc \frac{1}{3}$ 6. $\frac{1}{4} \bigcirc \frac{1}{3}$

7. $\frac{1}{2} \bigcirc \frac{1}{2}$ 8. $\frac{1}{3} \bigcirc \frac{1}{4}$

9. Rania needs $\frac{1}{4}$ of oil and $\frac{1}{3}$ of water to make a large batch of muffins. Will Rania use more oil or more water? Explain your answer using pictures, numbers, and words in the box below. Use your fraction models to help you.

10. Ashraf needs to cut some wood for a project. He needs $\frac{1}{4}$ of a meter for the top and $\frac{1}{3}$ of a meter for the base. Which piece of wood will be larger? Explain your answer using pictures, numbers, and words in the box below.

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4. TEACHER SAY: **Good job. Please open your student book to page Lesson 74: Apply, Part 2 and work independently to solve the Apply problems. Each problem is a comparison problem. Use your new circle fraction models to help you. Remember, our Essential Question asks us to notice the relationship between the denominator and the size of the fraction. If you finish early, try the Challenge problem.**

STUDENTS DO: Open student book to Apply, Part 2. Work independently to solve the problems using circle fraction models. Students who finish early may work on the Challenge problem.

TEACHER DO: Walk around the room, observing students as they work. Make note of students who struggle comparing unit fractions. Ask students to justify decisions and guide them to use fraction vocabulary: Questions might include:

- Explain how you know $\frac{1}{4}$ is less than $\frac{1}{2}$.
- If we made a model for $\frac{1}{10}$, would it be bigger or smaller than $\frac{1}{8}$? Why do you think so?

TEACHER SAY: **Please keep your student book out for Reflect.**

Reflect (5 to 10 minutes)

Directions


LESSON 74: MATH JOURNAL

Directions: Reflect on your learning about fractions today. Then, write your response to the journal prompt in the box below.

What is the relationship between the size of the denominator and the size of the fractional pieces as it relates to the whole? You can use words, numbers, pictures, and examples to explain your thinking.

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1. TEACHER SAY: **Today started with an Essential Question to think about as we explored fractions and specifically unit fractions. Turn to page Lesson 74: Math Journal in your student book and read the Essential Question.**

STUDENTS DO: Turn to the Math Journal page and read the Essential Question.

TEACHER SAY: **Reflect on your learning and write your thoughts about this question in the box. You can include words, numbers, pictures, and examples to help you explain your thinking.**

STUDENTS DO: Write a response to the prompt.

TEACHER DO: Collect students' books at the end of the lesson to read responses and gauge understanding of the relationship between the size of the denominator and the size of the fraction relative to the whole.

Lesson 75 Overview

LESSON OVERVIEW

This lesson begins with a brief review of Primary 2 mass concepts, including grams and kilograms. In Learn, students explore unit fractions where the whole is a set rather than a picture. This is a new concept for students as they investigate the idea that the whole can be an object, such as a rectangle or circle, or a set of objects and that a set of objects can be divided into equal parts. Students often confuse the numerator and denominator so continue to focus on developing students' understanding. For Reflect, students add to the definition of fraction they wrote in Lesson 71 and record the definition in the math glossary.

LEARNING OBJECTIVES

Students will:

- Identify unit fractions of a set.
- Expand originals definition of fraction.

LESSON PREPARATION FOR THE TEACHER

Have available one object that weighs about 1 gram and one object that weighs about 1 kilogram. See Chapter Preparation for Lesson 75 for examples.

Prior to the lesson, consider how you might divide students into sets of 2, 3, 4, 6, or 8 in order to have students consider fractions of those sets. For example, for a group of 6 students, you might ask, "What fraction of the group is wearing a red shirt?"

KEY VOCABULARY

- Gram
- Kilogram
- Mass
- Set
- Whole
- Review previous fractions vocabulary as needed.

MATERIALS

- Colored pencils or crayons
- Fractions anchor chart
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions

Note to the Teacher: In today's lesson, students review concepts around mass that they learned in Primary 2. Students learned the following:

- *Gram and kilogram units are often referred to as "weights," but they are actually measures of mass, or how much matter is in an object.*
- *An object's MASS is consistent and unchanging no matter where the object is—on Earth, on a mountain, at the bottom of the ocean, or on the moon.*
- *However, an object's WEIGHT can change. For example, an object has a different weight on the moon than it does on Earth due to the effects of gravity.*
- *Since students are measuring all objects here on Earth, it is okay if they use the word weight from time to time to help them build understanding of mass. However, remind them that mass and weight are not the same.*

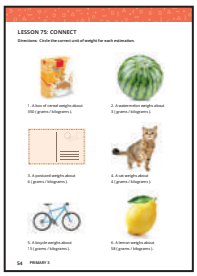
1. TEACHER SAY: For Connect today, we are going to review mass. You learned about mass last year. Raise your hand to tell me what you remember about mass.

STUDENTS DO: Raise hand to volunteer. Selected students share thinking.

TEACHER DO: If necessary, share the following definition:

Mass is a measure of the amount of matter in an object. Mass is usually measured in grams (g) or kilograms (kg).

TEACHER SAY: Mass is measured in grams and kilograms. I have here an object that has a mass of 1 gram (hold up the object). I also have an object that has a mass of 1 kilogram (hold up the object). In the metric system of measurement, we know that there are relationships between the units of measurement that involve multiples of 10, 100, and 1000. For example, 1 kilogram is equal to 1,000 grams.


LESSON 75: CONNECT

Directions: Circle the correct unit of weight for each estimation.

1. A box of cereal weighs about 350 (grams / kilograms).

2. A watermelon weighs about 3 (grams / kilograms).

3. A postcard weighs about 4 (grams / kilograms).

4. A cat weighs about 4 (grams / kilograms).

5. A bicycle weighs about 11 (grams / kilograms).

6. A lemon weighs about 100 (grams / kilograms).

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TEACHER DO: Have students open the Mathematics Student Book to page Lesson 75: Connect. Make sure students understand the directions and then have them begin working. When finished, students can compare work with a **Shoulder Partner**.

STUDENTS DO: Work in books to determine the correct unit of measurement. When done, check with **Shoulder Partner**. If time permits, share answers with the larger group.

TEACHER SAY: Nice job. As mathematicians, it is important to review concepts that we have practiced so they stay fresh. Let's get ready for Learn.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today we are going to look at fractions in a different way, where the whole is not a single object but a set of objects. For example, what if the whole was a group of people? I am going to call two students to the front of the room.

TEACHER DO: Choose one boy and one girl.

STUDENTS DO: Selected students go to the front of the class.

TEACHER SAY: I have created a set. This is a set of students. Using your fingers, show me how many people are in my set.

STUDENTS DO: Hold up 2 fingers.

TEACHER SAY: The whole is a set of 2 students. How many students in this set are girls? Hold up your fingers.

STUDENTS DO: Hold up 1 finger.

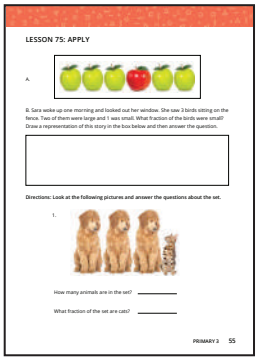
TEACHER SAY: In this whole set, 1 out of 2 students are girls. How could I write that as a fraction? Raise your hand to come up and share.

STUDENTS DO: Raise hand to volunteer. Selected student records answer on the board or asks another student for help.

TEACHER SAY: The set has 2 parts. One-half of my set are girls and one-half are boys. Let's try it again with a new set.

TEACHER DO: Repeat this process with either more students or drawings. Ensure that in each set one item is different from the others. For example, you can draw 3 squares and 1 circle and ask students what fraction of the set are circles. The main goal is to ensure students can determine the denominator. Some examples with students might include:

- 4 students in the set (1 girl and 3 boys). Ask what fraction are girls.
- 6 students in the set (all students except 1 with the same first initial). Ask what fraction does NOT have a name that starts with _____.


LESSON 75: APPLY

A.

B. Sara woke up one morning and looked out her window. She saw 3 birds sitting on the fence. Two of them were large and 1 was small. What fraction of the birds were small? Draw a representation of this story in the box below and then answer the question.

Directions: Look at the following pictures and answer the questions about the set.

1.

How many animals are in the set? _____

What fraction of the set are cats? _____

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Each time, have students first determine how many objects are in the set and then have a student record the fraction that answers the question. Note that, for now, all of these are unit fractions. One member of the group has something that the others do not. Guide students to see the connection between fractions of a set and the strip and circle models. Have students explore as many examples as you feel are needed to ensure that students understand the concept. This is also a great transition activity to do when you have a few minutes and want to keep students thinking about fractions.

2. TEACHER SAY: What if our set is a group of something else, like apples? Please open your student book to page Lesson 75: Apply.

STUDENTS DO: Turn to the Apply page.

TEACHER SAY: **You will see a set of apples at the top of the page. Use your fingers to show how many apples are in the set.**

STUDENTS DO: Hold up 6 fingers.

TEACHER SAY: **Hold up fingers to show how many of the apples are red.**

STUDENTS DO: Hold up 1 finger.

TEACHER SAY: **What fraction of this set of apples are red? Call out.**

STUDENTS DO: Call out answers. Selected students share reasoning.

TEACHER SAY: **The fraction of apples that are red is $\frac{1}{6}$. When we look at a set, we need to first determine how many objects are in the set. There are 6 total apples. Each part of this set is $\frac{1}{6}$ of the whole set. Sometimes, students say $\frac{1}{5}$ are red. Turn to your Shoulder Partner and discuss why someone might think $\frac{1}{5}$ of this set of apples are red. Give me a Thumbs Up when you are ready to share your thinking.**

STUDENTS DO: Discuss thinking with a **Shoulder Partner**. Give a **Thumbs Up** to volunteer. Selected students share reasoning.

Note to the Teacher: Answers will most likely include something such as, "The student saw 5 green ones and 1 red one, so they thought it was $\frac{1}{5}$. They did not count the total apples first to find the denominator."

3. TEACHER SAY: **With fractions, it is always important to first determine the total parts. That number becomes the denominator. Let's try one more together. I am going to share a story. You will draw a representation of this story and then solve it. I will call on some of you to share your thinking.**

TEACHER DO: Read problem B aloud to students.

STUDENTS DO: Draw a quick representation of the story and record $\frac{1}{3}$. Selected students go to the board, draw an image to represent the answer, and explain thinking.

TEACHER SAY: **Great thinking. For the rest of Learn, you will work on the remaining Apply problems.**

TEACHER DO: Make sure students understand the directions and then have them get started working independently to complete the activity. Encourage students who finish early to try the Challenge problems.

STUDENTS DO: Work through the problems in the student book. Students who finish early may work on the Challenge problems.

TEACHER DO: Walk around the class, observing students as they work. Offer assistance to students who are struggling and note who might need extra support at a later time. When Learn is almost over, use an **Attention Getting Signal**.

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: On our Fractions anchor chart is the basic definition we wrote after Lesson 71. Since then, we have explored fractions further. Turn to your Shoulder Partner and discuss how we could add to this definition to make it more detailed about what a fraction is. In a few minutes, you will share your thinking.

STUDENTS DO: Talk to **Shoulder Partner** about how to improve the definition of fraction.

TEACHER DO: After 1 to 2 minutes, use **Calling Sticks** to select students to share ideas. Some additions might include:

- Fractions have a numerator and a denominator.
- Unit fractions have a numerator of 1.
- Fractions are parts of a whole.
- The whole can be one item or one set of items.
- Decide as a group what to add to the anchor chart definition.

2. TEACHER SAY: These are all great ideas that we can add to our anchor chart to remind us what fractions are. I will add these to our anchor chart so we can reference them as we continue to work with fractions. Your job is to add this definition to the Math Vocabulary section in your student book.

TEACHER DO: Add students' ideas to the Fractions anchor chart.

STUDENTS DO: Turn to the Math Vocabulary section and record class definition of a fraction.

TEACHER SAY: Great job. Tonight, ask your parents or a friend what they think a fraction is. See if they come up with a definition similar to ours.

Lesson 76 Overview

LESSON OVERVIEW

In this lesson, students work to understand that fractions do not always represent quantities that are the same size. They investigate to learn that the quantity represented by a fraction depends on the size of the whole. For example, $\frac{1}{4}$ can represent a quantity of 5 if the whole is 20 or 1 if the whole is 4. They begin with an error analysis of a common mistake made when working with fractions and end by reflecting on learning to apply it in a new problem scenario.

LEARNING OBJECTIVES

Students will:

- Explain why the size of the whole matters when comparing two unit fractions.

LESSON PREPARATION FOR THE TEACHER

A collection of objects that are the same but different sizes. These can be actual objects or images. Examples: food items, school supplies, or drawings of shapes. See Chapter Preparation for Lesson 76 for detailed instructions.

KEY VOCABULARY

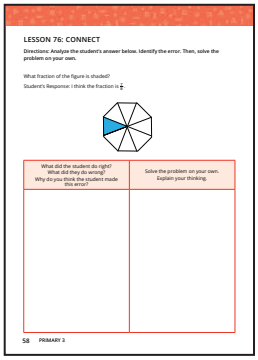
- Sets
- Wholes

MATERIALS

- Collections of objects to compare wholes and fractions
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 76: CONNECT

Directions: Analyze the student's answer below. Identify the error. Then, solve the problem on your own.

What fraction of the figure is shaded?

Student's Response: I think the fraction is $\frac{1}{4}$.

What did the student do right? What did they do wrong? Why do you think the student made this error?	Solve the problem on your own. Explain your thinking.

58 PRIMARY 3

1. TEACHER SAY: Please open your Mathematics Student Book to page Lesson 76: Connect and read the problem to yourself. See if you can figure out what the student did correctly, what they did incorrectly, why they might have made this error, and then solve the problem yourself.

STUDENTS DO: Turn to the Connect page and read the problem silently. Analyze the student's answer to identify the error and then work to correct it.

TEACHER DO: Give students 3 to 5 minutes to work on the problem. The problem represents a common error students make when working with fractions. Ask students to share work and facilitate a conversation about the importance of attending to what is being asked when trying to solve a problem, what the error was, and how they corrected it. Also, allow them to explain what the student did correctly.

Note to the Teacher: Error analysis is an important computational thinking skill. Engaging in error analysis builds students' skills in analyzing, checking, and correcting their own work. It also helps them understand that making mistakes (and correcting them) is an important part of learning. Error analysis can help students and teachers identify what the student knows and does not know related to a skill or concept.

Learn (35 to 45 minutes)

Directions

1. TEACHER DO: Have available the objects you gathered.

TEACHER SAY: In previous classes, we explored unit fractions and compared them when the size of the whole was the same, as with our fraction strips and circles. But, our learning target today is to explain how the size of the whole can change the quantity represented by a unit fraction. Let's take a quick look at some items to help you see what I mean.

TEACHER DO: Display the first pair of objects.

TEACHER SAY: I have two _____ (name of objects). If I split each of them in half, are the halves the same size? Whisper the answer into your hand.

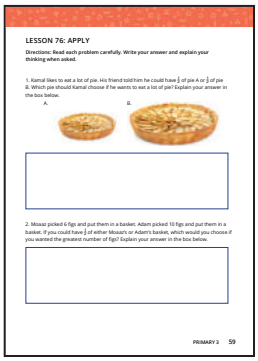
STUDENTS DO: Whisper answers into hands.

TEACHER DO: Call on a student to identify the item with larger halves.

TEACHER SAY: How can that be if they are both one-half of the whole object? How can we have one half that is larger and one half that is smaller if they are both represent $\frac{1}{2}$ of the object?

STUDENTS DO: Engage in a conversation with the teacher and classmates about the relationship between the size of the fraction and the size of the whole.

TEACHER DO: Summarize students' thinking and then repeat the exercise with at least two more pairs of objects. Be sure to include sets (rather than a whole object) in your comparison. For some students, it will make more sense to see the different quantities represented by $\frac{1}{2}$.


LESSON 76: APPLY

Directions: Read each problem carefully. Write your answer and explain your thinking when asked.

1. Kamal likes to eat a lot of pie. His friend told him he could have $\frac{1}{2}$ of pie A or $\frac{1}{3}$ of pie B. Which pie should Kamal choose if he wants to eat a lot of pie? Explain your answer in the box below.

A. B.

2. Mosaz picked 6 figs and put them in a basket. Adam picked 10 figs and put them in a basket. If you could have $\frac{1}{2}$ of either Mosaz's or Adam's basket, which would you choose if you wanted the greatest number of figs? Explain your answer in the box below.

PRIMARY 2 59

2. TEACHER SAY: Now it is your turn to investigate fractions with different size wholes. Please turn in your student book to page Lesson 76: Apply and read the directions to yourself. If you finish early, you may try the Challenge problems.

TEACHER DO: Make sure students understand the directions and have them begin working.

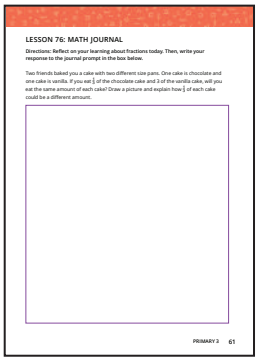
STUDENTS DO: Turn to the Apply page and read the directions silently. Work independently to complete the activity. Students who finish early may try the Challenge problems.

TEACHER DO: Monitor the class and check students' work to make sure they understand and can apply the concept. If any students need additional teaching, work with them individually. If this idea is difficult for the entire class, pause to give more examples with additional objects or work through the Apply page with them. At the end of learn, use an **Attention Getting Signal**.

TEACHER SAY: Please keep your student book out for Reflect.

Reflect (5 to 10 minutes)

Directions


LESSON 76: MATH JOURNAL

Directions: Reflect on your learning about fractions today. Then, write your response to the journal prompt in the box below.

Two friends baked you a cake with two different size pans. One cake is chocolate and one cake is vanilla. If you eat $\frac{1}{2}$ of the chocolate cake and $\frac{1}{2}$ of the vanilla cake, will you eat the same amount of each cake? Draw a picture and explain how $\frac{1}{2}$ of each cake could be a different amount.

PRIMARY 2 61

1. TEACHER SAY: Reflect for a moment on the activity you just completed. Think about what you learned about fractions and their relationship to the whole.

TEACHER DO: After about 1 minute, have students turn to page Lesson 76: Math Journal and read the journal prompt.

STUDENTS DO: Turn to the journal page and read the journal prompt. Work independently to respond to the question.

TEACHER DO: Give students 3 to 5 minutes to respond to the prompt. Collect the journals to read students' responses at a later time. Take note of students who need additional instruction and support understanding the relationship between the size of the whole and the quantity represented by a fraction of the whole.

2. TEACHER SAY: Think for a moment about what you could do if you are still confused about the math concept we investigated today. Raise your hand if you can think of a way to take responsibility for your learning.

STUDENTS DO: Raise hand to share response.

TEACHER DO: Call on several students to share. Possible responses include:

- I could ask the teacher for additional help.
- I could ask a friend to explain our learning in a different way.
- I could talk to my parents about fractions.
- I can ask for additional problems.
- I can find resources to help me further understand.

TEACHER SAY: Excellent ideas. You did great work today. I will collect your student books today.

Lesson 77 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students explore the relationship between wholes and the fractional parts of which they are composed. They are challenged to think about how one whole can also be represented as a fraction. They investigate a variety of shapes to determine how many fractional parts it takes to make one whole and learn that it depends on the total number of fractional parts. They apply this new skill to solve story problems.	Students will: • Write one whole as a fraction. • Explain how to write one whole as a fraction.	Review fraction vocabulary as needed.

LESSON PREPARATION FOR THE TEACHER

No additional preparation needed.

MATERIALS

- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 77: CONNECT

Directions: Read the question below. Then, record your answer in the box below. You can use words, numbers, pictures, and examples to explain your thinking.

A friend wants to share their candy bar with you. Would you rather have $\frac{1}{3}$ or $\frac{1}{4}$ of the candy bar?

62 PRIMARY 2

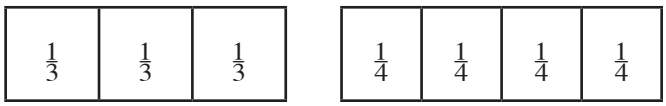
1. TEACHER SAY: Take out your Mathematics Student Book and turn to page Lesson 77: Connect. Please raise your hand if you would like to read the story problem to the class.

STUDENTS DO: Turn to the Connect page. Raise hand to volunteer. Selected student reads aloud the Connect problem.

TEACHER DO: Have students work independently to solve the Connect problem. Remind them to draw a picture to show thinking.

STUDENTS DO: Work independently to solve the problem.

TEACHER DO: Give students 3 to 5 minutes to work on the problem and then go over the work as a class. Ask a student to draw their thinking on the board. Make sure students understand that it is important to draw 2 rectangles of equal size for this picture and then divide them into thirds and fourths.

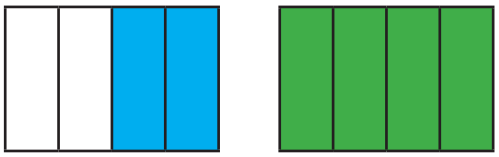


Note to the Teacher: Students have had conversations about what happens to the size of the unit fraction as they divide the whole into smaller and smaller pieces. Some students may recall this concept and discuss it in relation to the candy bar.

Learn (35 to 45 minutes)

Directions

1. TEACHER DO: Draw the images below on the board. Be sure the rectangles are of equal size.

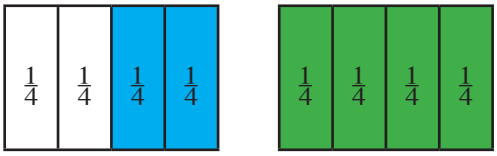


TEACHER SAY: Today our learning goal is to understand and write one whole as a fraction.

TEACHER DO: Direct students to look at the rectangles on the board and identify which is colored to represent one whole. Have student volunteers identify how many total parts are in each rectangle.

TEACHER SAY: What fraction is represented in both of these rectangles?

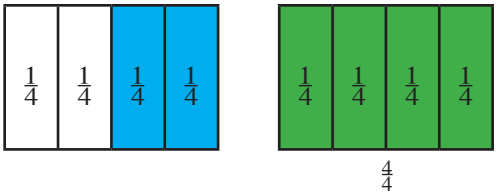
TEACHER DO: Call on students to answer and explain thinking. Then, label each section of each rectangle $\frac{1}{4}$.



TEACHER SAY: If each section is $\frac{1}{4}$ of the whole, how many fractional units does it take to make one whole? Tell your Shoulder Partner.

STUDENTS DO: Share answers with a **Shoulder Partner**.

TEACHER DO: Call on students until the correct answer is shared (4). Write $\frac{4}{4}$ under the fully



shaded rectangle.

Then, draw the following on the board:

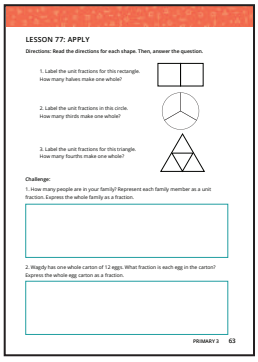
Have students identify what fraction is represented by each section of the rectangle and then label each section $\frac{1}{3}$.

2. TEACHER SAY: Raise your hand if you know how many thirds it would take to make one whole rectangle. Who can write the fraction that shows one whole?

STUDENTS DO: Raise hand to volunteer. Selected students share answers, record the fraction, and explain thinking.

TEACHER DO: If necessary, guide students' thinking to help them understand that $\frac{3}{3}$ represents the whole rectangle, or one whole.

TEACHER SAY: Think about what we have learned so far today. Do you have a prediction about how many sixths would make one whole? Raise your hand if you think you know.


LESSON 77: APPLY

Directions: Read the directions for each shape. Then, answer the question.

1. Label the unit fractions for this rectangle. How many halves make one whole?

2. Label the unit fractions in this circle. How many thirds make one whole?

3. Label the unit fractions for this triangle. How many fourths make one whole?

Challenge:

1. How many people are in your family? Represent each family member as a unit fraction. Express the whole family as a fraction.

2. Wagdy has one whole carton of 12 eggs. What fraction is each egg in the carton? Express the whole egg carton as a fraction.

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STUDENTS DO: Raise hand to volunteer. Selected students share thinking and explanations.

TEACHER DO: Some students may still be working to understand how one whole can also be a fraction. However, if students seem to easily grasp the concept, ask them additional questions that go beyond Primary 3 learning. For example, ask how many tenths, twentieths, and so on would make one whole.

3. TEACHER SAY: Please turn in your student book to page Lesson 77: Apply and begin

working. If you finish early, try the Challenge problems. I will be walking around to see if anyone needs help.

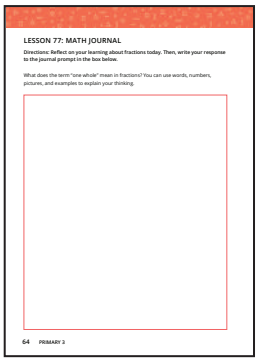
STUDENTS DO: Turn to the Apply page and work independently to complete the activity.

TEACHER DO: Walk around the classroom and check for understanding. Offer assistance to students who need it. If several students need extra support, consider pulling them into a small group for help with the learning activity. Note who can finish this work quickly without using the models and who requires more time. At the end of Learn, use an **Attention Getting Signal**.

TEACHER SAY: **Please keep your student books out for Reflect.**

Reflect (5 to 10 minutes)

Directions


LESSON 77: MATH JOURNAL

Directions: Reflect on your learning about fractions today. Then, write your response to the journal prompt in the box below.

What does the term "one whole" mean in fractions? You can use words, numbers, pictures, and examples to explain your thinking.

64 PRIMARY 3

1. TEACHER DO: Have students turn to page Lesson 77: Math Journal and read the journal prompt silently. Once students understand the question, have them begin working independently to record their response.

STUDENTS DO: Turn to the Math Journal page and respond to the prompt.

TEACHER DO: Give students 3 to 5 minutes to respond to the prompt. Collect the journals to read students' responses at a later time. Take note of students who need additional instruction and support understanding how to represent one whole as a fraction.

TEACHER SAY: **You did a great job stretching your thinking about fractions and wholes today. I will collect your student books.**

Lesson 78 Overview

LESSON OVERVIEW

In this lesson, students begin by reviewing division problems. This helps them prepare for the lesson, which focuses on the relationship between fractions and division. They will be examining this relationship by making direct connections between a model, a fraction, and a division equation.

LEARNING OBJECTIVES

Students will:

- Investigate the relationship between fractions and division using models.

LESSON PREPARATION FOR THE TEACHER

Prepare a set of 24 counters for each student.

KEY VOCABULARY

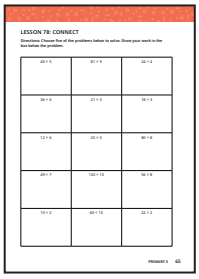
- Divide
- Division

MATERIALS

- Sets of 24 counters (one set per student)
- Fraction strips and/or circles
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions



1. TEACHER DO: Have students open the Mathematics Student Book to page Lesson 78: Connect and read the directions. Once all students understand the directions, have them begin working. Students who finish early may solve more than five problems.

STUDENTS DO: Turn to the Connect page and solve at least five division review problems.

TEACHER DO: When a few minutes of Connect time are left, go over the answers with students. Encourage students to correct mistakes.

TEACHER SAY: **Great job. Please keep your student books out for Learn.**

Learn (35 to 45 minutes)

Directions

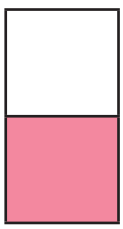
1. TEACHER SAY: **Our learning target today is to investigate the relationship between fractions and division. Let's start by looking at the word "divide." Turn and Talk to your Shoulder Partner and explain what the word "divide" means.**

STUDENTS DO: Share thinking with partners.

TEACHER DO: Give students 1 to 2 minutes to talk and then select several students to share with the class. They should understand that to divide means to break into equal parts.

TEACHER SAY: **How might fractions and division be related? If you have an idea, give me a Thumbs Up.**

STUDENTS DO: Give a **Thumbs Up** to volunteer. Selected students share thinking.



2. TEACHER DO: Record students' thinking. Make sure students understand that both division and fractions involves dividing wholes into equal parts. Then, draw the following on the board.

TEACHER SAY: **This rectangle is divided into 2 halves.**

TEACHER DO: Write $\frac{1}{2}$ on the board in each section. Draw another rectangle on the board.

TEACHER SAY: Raise your hand if you can show us how to divide this rectangle into 4 equal parts and tell us about the fraction?

STUDENTS DO: Raise hand to volunteer. Selected student divides the rectangle into 4 equal pieces and labels the parts.

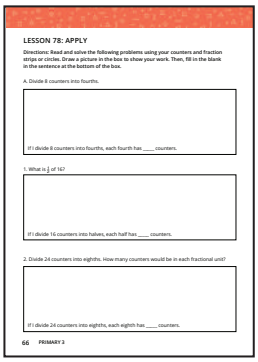
TEACHER DO: If needed, repeat this process to ensure students see the connection between dividing a shape into equal parts and its fractional name. Then, call an even number of students to the front of the room.

TEACHER SAY: This is a set of students. What if I wanted to divide this group in half? How many students would be in each fractional part? Raise your hand if you can think of a strategy we could use to solve this problem.

STUDENTS DO: Raise hand to volunteer. Selected students share strategies.

Note to the Teacher: Some students may use division facts while others may divide the students by having them physically move.

TEACHER DO: Repeat the process if needed to help students understand the connection between division and fractions. Then, distribute a set of counters to each student. Have students take out fraction strips or circles.


LESSON 78: APPLY

Directions: Read and solve the following problems using your counters and fraction strips or circles. Draw a picture in the box to show your work. Then, fill in the blank in the sentence at the bottom of the box.

A. Divide 8 counters into fourths.

If I divide 8 counters into fourths, each fourth has ____ counters.

1. What is $\frac{1}{2}$ of 16?

If I divide 16 counters into halves, each half has ____ counters.

2. Divide 24 counters into eighths. How many counters would be in each fractional unit?

If I divide 24 counters into eighths, each eighth has ____ counters.

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3. TEACHER SAY: Turn to page Lesson 78: Apply and count out 8 counters. We will do problem A together.

STUDENTS DO: Turn to the Apply page and count out 8 counters.

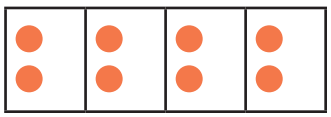
TEACHER SAY: Now, the question asks you to divide the 8 counters into fourths. Take out your fourths strips or your fourths circle. If you are using your strips, lay out the four $\frac{1}{4}$ pieces to make the whole strip.

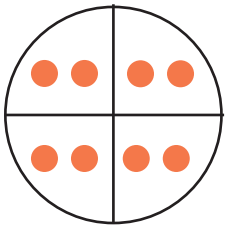
STUDENTS DO: Take out the appropriate fraction model and prepare to solve the problem with the teacher.

TEACHER SAY: We want to know how many counters would be in one of these fourths. Turn to your Shoulder Partner and see if you can decide on a strategy for using your fraction models to help you solve the problem. When you are ready, raise your hand.

STUDENTS DO: Talk to partner to decide on a division strategy. Raise hand when ready. Selected students share strategies and explain thinking.

TEACHER DO: If no students identify an effective strategy, **Model** how they can use $\frac{1}{4}$ strips or circle to evenly divide the counters. See examples below.





TEACHER SAY: Now we can draw a picture to show what we did and record our solution. When we divided 8 counters into four equal parts, how many counters are in one-fourth? Call out.

STUDENTS DO: Call out the answer.

4. TEACHER SAY: Nice work. Please work on your own to solve problems 1 through 3. If you

finish early, challenge yourself to write a similar problem to solve.

STUDENTS DO: Work independently to complete the learning activity. Students who finish early may try the Challenge problem.

TEACHER DO: Walk around and observe students as they work. Identify students who may need additional instruction. Consider pairing them with a student who can help them understand the concept and complete the work. When a few minutes are left in Learn, use an **Attention Getting Signal**.

TEACHER SAY: Great work today. Please turn to your Shoulder Partner and compare your answers. If you disagree about something, talk it through. If you cannot come to an agreement, raise your hand.

STUDENTS DO: Share answers with a **Shoulder Partner** and work through answers that do not match.

TEACHER SAY: Please put your student books away and prepare for Reflect.

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: Today we focused on the relationship between fractions and division. Reflect for 1 minute on what you learned today. When I give you a signal, share your learning with your Shoulder Partner.

STUDENTS DO: Think quietly for 1 minute about learning. After 1 minute, talk to partner about learning.

TEACHER DO: Give students 1 to 2 minutes to talk to partners. Then call on several students to discuss learning with the class. Take note of misconceptions and help students correct them before moving on. Consider asking other students to help.

TEACHER SAY: You did a good job today working with fractions and thinking about your own thinking. Put away your materials.

Lesson 79 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students further explore the connection between fractions and division by looking at sets that make one whole. They investigate how to divide a set into fractions and determine the how many parts of the set are in each fraction. This is done with models to help scaffold learning.	Students will: • Divide a set into equal parts. • Determine the quantity in each fractional part of a set. • Explain the relationship between fractions and division.	Review fractions vocabulary as needed.

LESSON PREPARATION FOR THE TEACHER

No additional preparation needed.

MATERIALS

- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions

1. TEACHER SAY: I have a challenging question for you today: Is $\frac{1}{2}$ always the same amount? Think for a moment and then talk to your Shoulder Partner.

STUDENTS DO: Think quietly about the question and then share thinking with partner.

TEACHER DO: After about 2 minutes, call on several students to share. Possible answers may include:

- Halves are not the same if one whole is larger than the other.
- Halves are not the same if one set is larger than the other (for example, $\frac{1}{2}$ of a class is different if one class has 20 students and another class has 40 students).

Students should understand that, unlike whole numbers, fraction size is dependent on the value of the whole or set it is describing.

TEACHER SAY: It is always so exciting to hear your mathematical thinking.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today your goal is to be able to explain the connection between fractions and division. This is also our Essential Question for today: How are fractions and division related? Raise your hand if you can remind us how we started answering this question in our last math lesson when we used counters and fraction models.

STUDENTS DO: Raise hand to volunteer. Selected students share explanations.

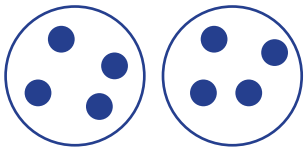
Note to the Teacher: Students should note that they used fraction models to divide counters into equal groups to determine how many counters were in each fractional part of the whole. They should be able to explain this in their own words and provide an example.

TEACHER SAY: In our last math lesson, we talked about whole objects. Let's look at sets to further explore this relationship.

TEACHER DO: Draw 8 dots on the board as shown below.

Have students discuss how they could divide the dots into equal groups. Circle the dots as they explain groupings. Some students may divide the dots into 2 groups of 4, while others may divide them into 4 groups of 2 or 8 groups of 1.

For each approach, ask what fraction is represented by each circle and how many dots are in each circle. For example, in the image below, the dots have been divided into 2 groups of 4.



Ask:

- What fraction is represented here? The set of 8 dots was divided into _____. (halves)
- How many dots are in each half? (4)
- So, what is one-half of 8? (4)
- What is 8 divided by 2? (4)

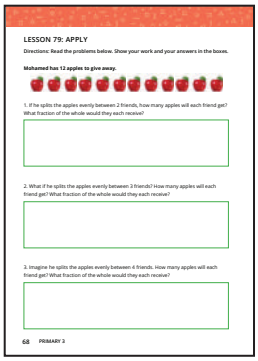
2. TEACHER SAY: Now, let's put a story behind these 8 dots. They are a set that makes one whole. I baked one whole batch of rolls. If I gave them evenly to 4 friends, what fraction of the whole would each friend receive, and how many rolls would they each get? Tell your Shoulder Partner.

TEACHER DO: Write the questions on the board:

- What fraction of the whole would each friend receive?
- How many rolls would they each get?
- 8 ÷ 4 = _____?

STUDENTS DO: Work with partners to answer the questions.

TEACHER DO: Call on students to share thinking. Students need to see that each friend would get $\frac{1}{4}$ of the whole batch of rolls. Write $\frac{1}{4}$ on the board. If students understand, move on to the Apply learning activity. If not, repeat the above by splitting the batch of rolls between 8 friends, where each friend gets $\frac{1}{8}$.


LESSON 79: APPLY

Directions: Read the problems below. Show your work and your answers in the boxes.

Mohamed has 12 apples to give away.

1. If he splits the apples evenly between 2 friends, how many apples will each friend get? What fraction of the whole would they each receive?

2. What if he splits the apples evenly between 3 friends? How many apples will each friend get? What fraction of the whole would they each receive?

3. Imagine he splits the apples evenly between 4 friends. How many apples will each friend get? What fraction of the whole would they each receive?

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3. TEACHER SAY: Open your Mathematics Student Book to page Lesson 79: Apply and read the directions silently.

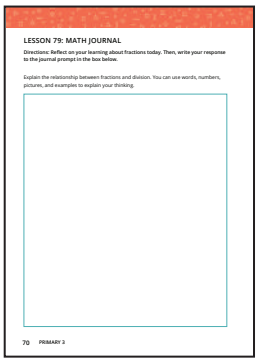
STUDENTS DO: Open to the Apply page and read the directions. When all students understand the directions, they may begin working independently to complete the learning activity.

TEACHER DO: Monitor students as they work on the activity. Some students may find the manipulation of several numbers difficult to manage. Consider pairing students for this activity so they can support each other and confirm or correct their thinking. At the end of Learn, use an **Attention Getting Signal**.

TEACHER SAY: Please keep your books out for Reflect.

Reflect (5 to 10 minutes)

Directions


LESSON 79: MATH JOURNAL

Directions: Reflect on your learning about fractions today. Then, write your response to the journal prompt in the box below.

Explain the relationship between fractions and division. You can use words, numbers, pictures, and examples to explain your thinking.

70 PRIMARY 3

1. TEACHER SAY: Please turn to page Lesson 79: Math Journal and read the prompt to yourself. I will ask one of you to read the prompt aloud.

STUDENTS DO: Turn to the journal page and read the prompt silently. Selected student reads the prompt aloud. Students work independently to respond to the prompt and explain thinking.

TEACHER DO: Give students 3 to 5 minutes to respond to the prompt. Collect the journals to read students' responses at a later time. Take note of students who need additional instruction and support to explain the relationship between fractions and division.

TEACHER SAY: You did a great job working with complicated fractions concepts. You are learning so much, and I admire that you persevere when problems are challenging. I will collect your student books.

Lesson 80 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students review the fractions concepts learned so far. They then create models to help them compare real-life scenarios of fraction size by answering questions in a game called "Would You Rather?"	Students will: • Reason with fractions in real-life applications.	Review fraction vocabulary as needed.

LESSON PREPARATION FOR THE TEACHER

- No additional preparation needed.

MATERIALS

- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions

Note to the Teacher: In today's Connect problem, students apply understanding of fractions and time to solve a problem. It is a challenging task, so provide support as needed. Encourage students to help each other.


LESSON 80: CONNECT

Directions: Read the problem below. Show your work and write your answer in the box below.

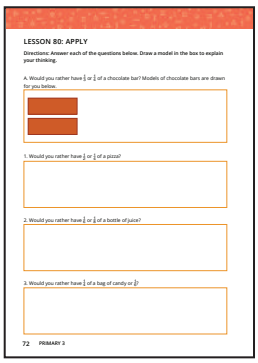
PRIMARY 3 71

1. TEACHER DO: Have students open the Mathematics Student Book to page Lesson 80: Connect. Select a volunteer to read the problem aloud. Give students 3 to 5 minutes to work on the problem. Then, call on several volunteers to share work with the class.

STUDENTS DO: Work independently to solve the Connect problem. Selected students share answers and explain thinking to the class.

Learn (35 to 45 minutes)

Directions


LESSON 80: APPLY

Directions: Answer each of the questions below. Draw a model in the box to explain your thinking.

A. Would you rather have $\frac{1}{4}$ or $\frac{1}{3}$ of a chocolate bar? Models of chocolate bars are drawn for you below.

1. Would you rather have $\frac{1}{2}$ or $\frac{1}{4}$ of a pizza?

2. Would you rather have $\frac{1}{2}$ or $\frac{1}{3}$ of a bottle of juice?

3. Would you rather have $\frac{1}{2}$ of a bag of candy or $\frac{1}{3}$?

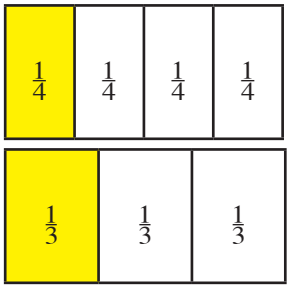
72 PRIMARY 3

1. TEACHER SAY: **Our learning goal for today is to use fractions to solve real-life kinds of problems. You will be doing this in your student book, playing a game called "Would You Rather?"**

TEACHER DO: Have students turn to page Lesson 80: Apply and read the directions and first problem silently. Call on a volunteer to read the directions and first problem aloud. Have students work with a **Shoulder Partner** to solve the first problem.

STUDENTS DO: Turn to the Apply page and read the directions. Work with **Shoulder Partner** to solve problem A.

TEACHER DO: Give students 3 to 5 minutes and then ask them to raise hands and share thinking with the whole group. Either let them draw models on the board or use fraction models to record thinking. An example is shown below.



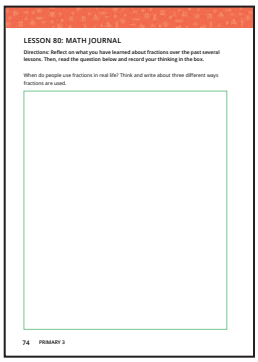
If students are ready, they can continue working on the problems either independently or with a **Shoulder Partner**. Encourage students who finish early to try the Challenge problems. If they need more modeling, continue on as a class to the second problem. Note that students may decide not to choose the larger amount of an item. This is fine as long as they can explain their thinking. For example, I would rather have $\frac{1}{4}$ of the chocolate bar because I do not like chocolate.

As students work, walk around to check for understanding. Take note of students who may need additional instruction and practice. At the end of Learn, use an **Attention Getting Signal**.

TEACHER SAY: **Please keep your student books out for Reflect.**

Reflect (5 to 10 minutes)

Directions


LESSON 80: MATH JOURNAL

Directions: Reflect on what you have learned about fractions over the past several lessons. Then, read the question below and record your thinking in the box.

When do people use fractions in real life? Think and write about three different ways fractions are used.

74 PRIMARY 2

1. TEACHER DO: Have students turn to page Lesson 80: Math Journal. Read the journal prompt aloud, then give students 1 minute of **Think Time** before having them share thinking with a **Shoulder Partner**.

STUDENTS DO: Turn to the journal page. Reflect quietly, then share ideas with a partner.

TEACHER DO: After the partner share time, give students 3 to 5 minutes to respond to the journal prompt. Collect the journals to read students' responses at a later time. Take note of students who will need additional instruction and support to understand and work with fractions.

TEACHER SAY: **Think about how much you have learned about fractions since we first started talking about them. I would like to continue to hear about fractions you see and work with outside of school. Give yourself a pat on the back for all the hard work and thinking you have done. While you do that, I will collect your student books.**

STUDENTS DO: Give themselves a pat on the back.

PRIMARY 3

Mathematics

HOW THE WORLD WORKS

ORIGINS

Chapter 3

Lessons 81 to 90

Chapter 3: Lessons 81 to 90

In this chapter, students continue exploring fractions, expanding their current understanding to fractions on number lines and fractions larger than unit fractions. At the end of the chapter, students use concrete models (fraction kits from the previous chapter) to add and subtract fractions with like denominators. Progression of fractional understanding is intentionally slow and methodical so that students gain a deep, conceptual understanding of parts of numbers and parts of wholes.

COMPONENT	DESCRIPTION	LESSONS
Connect	During this daily routine, students build fluency in previously learned skills, make connections between prior learning and the upcoming Learn segment, and discuss mathematics concepts. Students may be introduced to an engaging, real-world math problem that establishes a purpose for learning a new skill or concept.	10 to 15 minutes
Learn	During this daily routine, students learn and apply various math skills and concepts. Students engage in exploration, experimentation, problem-solving, collaboration, and discussion to build understanding and application of new skills and concepts and make connections to prior learning. Students learn to think and work like mathematicians and persevere in developing foundational understanding of challenging skills and concepts.	35 to 45 minutes
Reflect	During this daily routine, students develop the ability to express mathematical ideas by talking about discoveries, using math vocabulary, asking questions to make sense of learning tasks, clarifying misconceptions, and learning to see things from peers' perspectives.	5 to 10 minutes

Learning Indicators

Throughout Lessons 81 to 90, students will work toward the following learning indicators:

C. NUMBERS AND OPERATIONS IN BASE TEN:

3.a. Describe a proper fraction $1/b$ as the quantity formed by 1 part when a whole is partitioned into b equal parts.

3.b. Read and write proper fractions.

3.e. Demonstrate understanding that the proper fraction b/b is equal to one whole.

3.h. Demonstrate understanding that comparisons of fractions are valid only if the wholes are the same.

E. GEOMETRY:

1.b. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole.

1) For example, partition a shape into 4 parts with equal area and describe the area of each part as $\frac{1}{4}$ of the area of the shape.

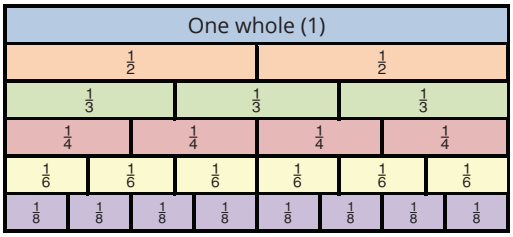
CH 3 Pacing Guide

LESSON	INSTRUCTIONAL FOCUS
81	Students will: • Use models to show fractions on a number line.
82	Students will: • Show fractions on a number line to solve story problems. • Given a fraction, explain the relationship between the number of equal parts on a number line and the denominator. • Define numerator and denominator in their own words and provide examples.
83	Students will: • Locate unit fractions on a number line (0 to 1). • Compare unit fractions on a number line between 0 and 1.
84	Students will: • **Model** fractions with numerators greater than 1.
85	Students will: • Express a given number in expanded form. • Divide a number line into a given number of equal parts. • Locate proper fractions on a number line. • Draw models of fractions using shapes or sets.
86	Students will: • Count forward and backward by fractions. • Read and write proper fractions. • Compare unit and proper fractions.
87	Students will: • Compare two fractions with the same denominator. • Compare two fractions with the same numerator. • Explain how to compare fractions.
88	Students will: • Order four numbers from least to greatest or greatest to least. • Add two fractions with the same denominator. • Explain the importance of common denominators when adding fractions.
89	Students will: • Subtract fractions with the same denominator. • Explain how to add and subtract fractions with common denominators.
90	Students will: • Apply understanding of fractions to solve real-world problems. • Write a real-world story problem involving fractions.

Chapter Preparation for Teacher

For Lesson 81:

- Display Fractions anchor chart, if it is not already displayed.
- Display the teacher model of the fraction strips manipulative. Arrange the strips vertically in order from one whole to $\frac{1}{8}$ as shown below.



- Gather blank sheets of paper (one per student). The paper must be big enough for students to fit all of the fraction model strips.

For Lesson 83:

- Cut strings 20 centimeters in length. You will need one string per student, plus one for the teacher.

For Lesson 86:

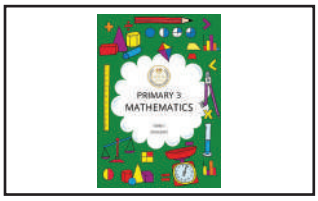
- Print and cut out sets of the Fraction Game cards (one set per pair of students). See the Fraction Game Cards Blackline Master.
  - If possible, print the cards on sturdy paper.
  - Have students store cards in baggies or envelopes for future use.

For Lesson 87:

Gather fraction models (teacher set and student sets) created in Lesson 72.

Materials Used

Student book

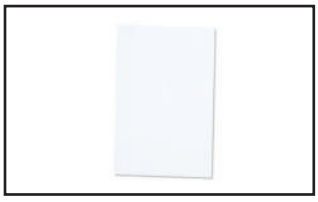


Pencil

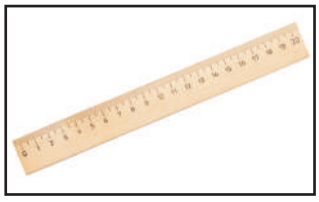
Pieces of string (one per student plus one for the teacher)

Colored pencils or markers

Blank paper (one per student)



Rulers (one per student)



Scissors

Fraction Game cards (one set of cards for each pair of students)

Fractions anchor chart

Fraction models—teacher set and student sets

Fraction model strips and circles—teacher set and student sets

Lesson 81 Overview

LESSON OVERVIEW

In this lesson, students begin by reviewing how many unit fractions are in one whole. In Learn, they use fraction models to explore fractions on the number line, building connections between whole numbers on the number line and fractions of one whole. Students end the lesson by reflecting on current understanding of fractions on the number line and identifying questions they still have.

LEARNING OBJECTIVES

Students will:

- Use models to show fractions on a number line.

LESSON PREPARATION FOR THE TEACHER

- Display Fractions anchor chart that was created in Chapter 2, if not already displayed.
- Gather blank sheets of paper (one per student). The paper must be big enough for students to fit all of the fraction model strips.

KEY VOCABULARY

- Eighths
- Equal parts
- Fourths
- Fraction
- Fractional part
- Halves
- Number line
- Sixths
- Thirds

MATERIALS

- Fractions anchor chart
- Fraction Model—Teacher Strips (one set for the teacher)
- Students' fraction model strips
- Blank paper (one per student)
- Rulers (one per student)
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions

1. TEACHER DO: Ask students to share a definition for UNIT FRACTION. If necessary, remind students that unit fractions have a numerator of 1. Ask students to explain what the denominator in a unit fraction represents. Next, give students a unit fraction (for example, $\frac{1}{6}$) and ask students to tell you how many units there are in one whole (in this example, 6). Continue with $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{8}$, and $\frac{1}{2}$. If students struggle, encourage them to check the fraction strips model you displayed.

TEACHER SAY: You have shown that you know that one whole, when it is written as a fraction, has the same numerator and denominator. I think you are ready for a challenge. How many twenty-thirds would it take to make a whole? Whisper your answer.

STUDENTS DO: Whisper answers.

TEACHER DO: Continue with other large numbers, such as 50 or 100, to determine whether or not students understand the relationship between the denominator and the number of units it takes to make one whole. If possible, have student volunteers explain their understanding to the class.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: When you first started learning about numbers, you worked with number lines to figure out how numbers relate to each other, to compare numbers, and to add and subtract numbers. Fractions are numbers, too, and today we are going to use number lines to learn more about them.

TEACHER DO: Have students take out fraction model strips and hold up the model that represents one whole. As students are doing that, distribute blank sheets of paper.

TEACHER SAY: Turn your paper so you are looking at a long side. Lay your one-whole fraction strip along the top of the paper. This sheet will be used to make a few number lines so start at the top and think about spacing.

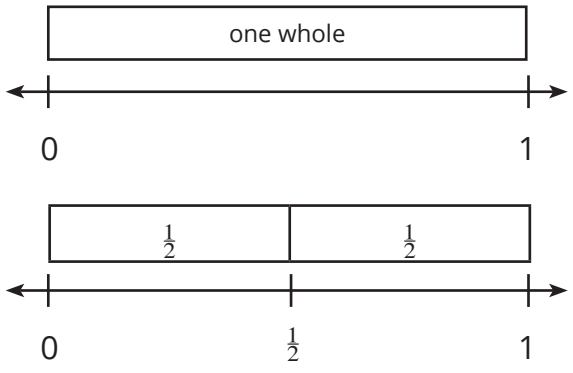
TEACHER DO: Go through the following steps one at a time, slowly modeling each step on the board.

1. Lay the one-whole strip on the paper.
2. Using a ruler, draw a horizontal line below the fraction strip that is a bit longer than the strip.
3. Make a small mark on the line even with the left end of your strip.
4. Label the mark "0" above the line. (Explain that this is where we start measuring the length of the strip.)
5. Make a small mark on the line even with the right end of your strip.
6. Label that mark "1" above the line. See example:

TEACHER SAY: We now have a number line. This line is labeled 0 on the left and 1 on the right. If we start at 0 and move to the right, the 1 tells us when we have traveled one whole length of the strip. This line represents 1, just as our strip represents 1. Which fraction model will help us draw another number line that shows halves?

TEACHER DO: Call on students to answer the question. Have students take out the $\frac{1}{2}$ fraction strips and arrange them to make one whole under the first number line. Go through the following steps:

1. Draw a number line under the $\frac{1}{2}$ fraction models.
2. Write a 0 on the number line at the left. Be sure the line and the zero line up with the ends of the model.
3. Make a mark on the number line at the right end of the FIRST $\frac{1}{2}$ model. This is the length of $\frac{1}{2}$ of the whole fraction strip at the top of the page.



4. Label that mark $\frac{1}{2}$.

TEACHER SAY: Now you have a number line that shows where $\frac{1}{2}$ is located. The length of the line, which is one length long, has been divided into halves, or 2 equal parts. Our first fraction strip and number line show one whole. Our second set of fraction strips and our second number line are the same length as the first, but are cut into halves.

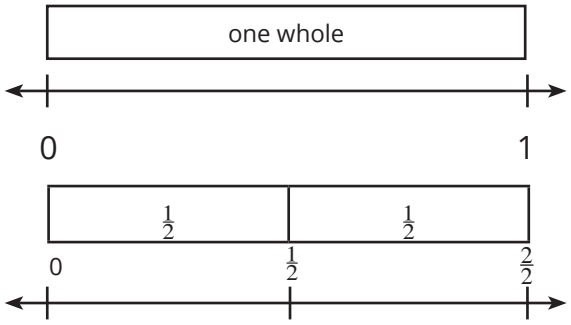
TEACHER DO: Point to your model on the board to help students develop understanding of fractions on the number line.

TEACHER SAY: If we start at 0, we have not traveled any halves. We are at zero halves. If we jump to the first line, we have traveled $\frac{1}{2}$ of the length, or one of the fractional parts. What if we then jump to the end? We are now at the 1, but how many halves have we traveled? Whisper to your partner.

STUDENTS DO: Whisper answers to partners.

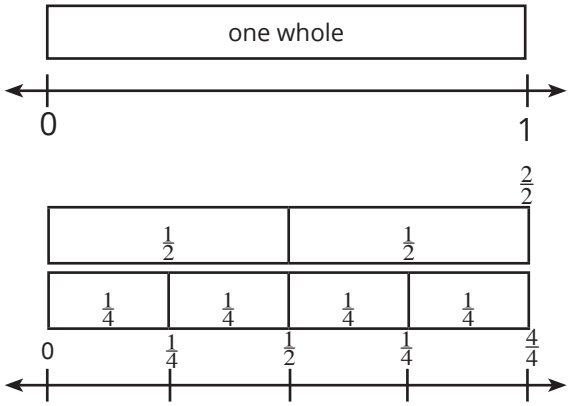
TEACHER SAY: We have traveled 2 halves, or $\frac{2}{2}$, which is the same as one whole. Under the 1, let's record $\frac{2}{2}$.

TEACHER DO: Record $\frac{2}{2}$ under the 1.



STUDENTS DO: Record $\frac{2}{2}$.

2. TEACHER DO: Repeat procedure for fourths. Once finished, ask questions to assess students' understanding. Examples are below.



- How many equal parts is this line broken up into?
- If we start at the zero, how many fourths have we traveled?
- Put your finger on $\frac{2}{4}$ on your number line. What other fraction is that equal to?

Note to the Teacher: Although you have not yet introduced proper fractions beyond unit fractions, allow students to label number lines with non-unit fractions (for example, $\frac{2}{4}$ and $\frac{3}{4}$). This will help them build familiarity with other fractions and their relationship to unit fractions, even though they will not be assessed on understanding those fractions. If students are unable to label fractions without your support, have them copy your examples from the board.

3. TEACHER SAY: Now, you will make one more number line using your $\frac{1}{3}$ fraction models. When you are done, share and check your work with your Shoulder Partner.

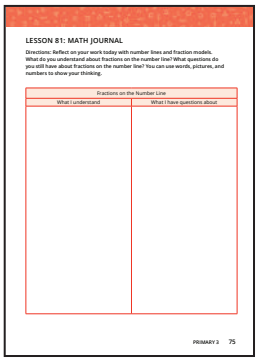
TEACHER DO: Give students time to draw and label the $\frac{1}{3}$ number line. Allow students to struggle with this and resist walking them through the process. If students finish quickly, have them repeat the process for the $\frac{1}{6}$ fraction models. As students work, walk around and take note of students who are struggling and may need additional instruction and support.

STUDENTS DO: Work independently to create a $\frac{1}{3}$ number line using fraction model strips. Check work with **Shoulder Partner** when finished.

TEACHER DO: At the end of Learn, have student volunteers show work on the board. Encourage students to correct their work, if necessary.

Reflect (5 to 10 minutes)

Directions


LESSON 81: MATH JOURNAL

Directions: Reflect on your work today with number lines and fraction models. What do you understand about fractions on the number line? What questions do you still have about fractions on the number line? You can use words, pictures, and numbers to show your thinking.

Fractions on the Number Line	
What I understand	What I have questions about

PRIMARY 2 75

1. TEACHER DO: Have students open the Mathematics Student Books to page Lesson 81: Math Journal and read the journal prompts silently. Make sure students understand the directions and then have them begin working.

STUDENTS DO: Turn to the journal page and read the questions silently. Ask clarifying questions as needed. Work independently to respond to the prompt.

TEACHER DO: Collect student books and read journal entries to assess initial understanding of fractions on the number line. You can use this information to target instruction in the next lessons.

TEACHER SAY: **Great job. Tomorrow we will think more about this question as we look at number lines again. I will collect your student books.**

Lesson 82 Overview

LESSON OVERVIEW

In Connect, students begin to connect the use of number lines to solving story problems. In Learn, students move away from using concrete models to help them make number lines to a more abstract understanding. Specifically, they build understanding that the denominator can inform them how to equally divide a number line to represent a given fraction. To apply learning, students read story problems and create number lines showing fractional parts to help them answer questions. In Reflect, students record definitions of numerator and denominator and self-assess understanding of today's lesson.

LEARNING OBJECTIVES

Students will:

- Show fractions on a number line to solve story problems.
- Given a fraction, explain the relationship between the number of equal parts on a number line and the denominator.
- Define numerator and denominator in their own words and provide examples.

LESSON PREPARATION FOR THE TEACHER

- Prior to the lesson, draw on the board a number line divided into thirds.

KEY VOCABULARY

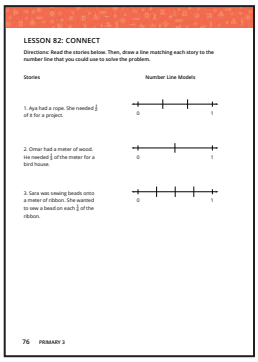
- Denominator
- Numerator
- Unit fraction
- Review fraction vocabulary as needed.

MATERIALS

- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 82: CONNECT

Directions: Read the stories below. Then, draw a line matching each story to the number line that you could use to solve the problem.

Stories | Number Line Models

1. Aya had a rope. She needed $\frac{1}{2}$ of it for a project.

2. Omar had a meter of wood. He needed $\frac{1}{3}$ of the meter for a bird house.

3. Sara was sewing beads onto a meter of ribbon. She wanted to sew a bead on each $\frac{1}{4}$ of the ribbon.

0 1

0 1

0 1

76 PRIMARY 3

1. TEACHER DO: Have students open the Mathematics Student Book to page Lesson 82: Connect, read the directions, and solve the problems.

STUDENTS DO: Work independently to solve the Connect problems.

TEACHER DO: After 2 to 3 minutes, call on students to share answers and explain thinking. Students should note that they need to consider the fraction of the whole needed in each problem and the number of pieces into which each number line is divided. For example, in the first problem, Aya needed $\frac{1}{2}$ of a piece of rope, so the number line model must have two parts. If necessary, use questioning to guide students' thinking to this conclusion. Confirm all correct answers and observations.

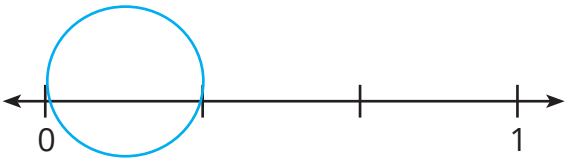
TEACHER SAY: Good ideas. On our Fractions anchor chart, we have a definition of denominator that states that the denominator tells us how many parts are in the whole. So, if we need $\frac{1}{2}$, that means the whole is divided into 2 equal parts. On a number line, the space between 0 and 1 is divided into 2 equal parts. Let's explore this further.

Learn (35 to 45 minutes)

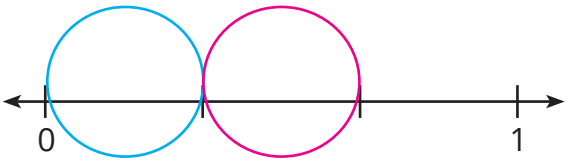
Directions

1. TEACHER SAY: Our learning goal today is to explore the connection between equal parts and number lines. In Connect, we matched story problems to various number lines by looking at the denominator. That helped us know how many equal parts the line needed to be broken into. Let's look again at the number line that represented Omar's piece of wood. Omar needed $\frac{1}{3}$, so we needed to break up the line into 3 equal parts. Who can tell us what this part represents?

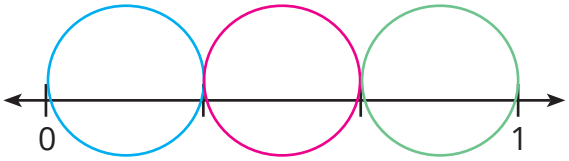
TEACHER DO: Circle the first $\frac{1}{3}$ of the number line on the board. Example:



Call on students to share thinking. Confirm that the correct answer is $\frac{1}{3}$. Repeat for the second third. Example:

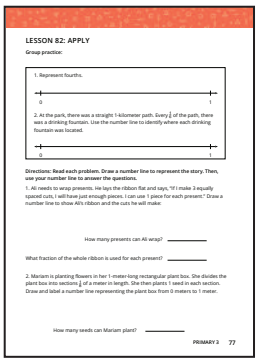


Circle the final third on the number line. Example:



TEACHER SAY: Give me a Thumbs Up if this last part represents $\frac{1}{3}$ also.

STUDENTS DO: Give a **Thumbs Up** if they agree.


LESSON 82: APPLY

Group practice:

1. Represent fourths.

0 1

2. At the park, there was a straight 1-kilometer path. Every $\frac{1}{6}$ of the path, there was a drinking fountain. Use the number line to identify where each drinking fountain was located.

0 1

Directions: Read each problem. Draw a number line to represent the story. Then, use your number line to answer the questions.

1. Ali needs to wrap presents. He lays the ribbon flat and says, "If I make 3 equally spaced cuts, I will have just enough pieces. I can use 1 piece for each present." Draw a number line to show Ali's ribbon and the cuts he will make.

How many presents can Ali wrap? _____

What fraction of the whole ribbon is used for each present? _____

2. Mariam is planting flowers in her 1-meter-long rectangular plant box. She divides the plant box into sections $\frac{1}{4}$ of a meter in length. She then plants 1 seed in each section. Draw and label a number line representing the plant box from 0 meters to 1 meter.

How many seeds can Mariam plant? _____

PRIMARY 3 77

TEACHER SAY: Each of these equal parts is $\frac{1}{3}$ of the whole. Turn in your student books to page Lesson 82: Apply.

STUDENTS DO: Turn to the Apply page.

TEACHER SAY: Look at problem number 1. There is a number line labeled 0 on one end and 1 on the other end. If I wanted this line to represent fourths and did not have my fraction model to help me, how could I do it? Go ahead and try. If you and your Shoulder Partner would like to work together, you may. When you are finished, give me a Thumbs Up.

TEACHER DO: As students are working, draw a number line showing 0 and 1. Make sure the line is long enough to easily show 4 equal sections.

STUDENTS DO: Work independently or with a partner to divide the number line into fourths. Give a **Thumbs Up** when finished. Selected students show work on the board and explain thinking.

TEACHER SAY: Great work. The number line on the board shows four equal parts. This first mark represents $\frac{1}{4}$ of the whole. Circle $\frac{1}{4}$ on your number line.

STUDENTS DO: Circle $\frac{1}{4}$ on the number line provided.

TEACHER SAY: Read the second problem to yourself and then use the second number line to show where the drinking fountains are located. Give me a Thumbs Up when you are finished.

STUDENTS DO: Read the problem silently and then mark the number line to show sixths. Selected students show work on the board and explain thinking. If necessary, students may ask a friend for help.

TEACHER SAY: Great. When we had our fraction models, each piece represented one fractional part. On the number line, the spaces represent the fractional part. So the first water fountain was $\frac{1}{6}$ of the way along the path, at the first mark. Use your fingers to show me how many water fountains are on the path in all.

STUDENTS DO: Use fingers to show answers.

TEACHER DO: Confirm the correct answer. If some students show an incorrect answer, have student volunteers explain how they know there are 6 fountains.

TEACHER SAY: **Now, it is your turn. For each story, draw a number line that represents it and answer the questions on the lines below. If you finish early, you may try the Challenge problem.**

STUDENTS DO: Work independently to solve the Apply problems. Students who finish early may work on the Challenge problem.

TEACHER DO: Walk around the room, observing students as they work. Offer assistance to those who might need extra support. Check to see that students are dividing number lines into equal parts based on the fractional part mentioned in the story. When a few minutes are left in class, use an **Attention Getting Signal**.

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: **Our goal today was to think about number lines and how to show fractional parts with equal spacing. For Reflect, let's do a quick self-assessment and then record two important fraction words in the Math Vocabulary section of our student books.**

First, think about how you did today understanding how to make a number line to match a story. If you felt like you understood how to do this, give a Thumbs Up. If you think you need more practice, give a Thumbs Sideways.

STUDENTS DO: Self-assess understanding with a **Thumbs Up** or sideways.

TEACHER DO: Take note of students who holding up a sideways thumb. Be sure to check in with them at a later time and to provide additional support in upcoming lessons. Consider pairing them with a student who understands and can apply the new fractions concepts.

TEACHER SAY: **Thank you for reflecting on your learning today. Good mathematicians think about what they know and what they still need to learn. They understand that we all learn at our own pace and that sometimes it is important to ask for help.**

We have already written down a definition of fractions, but now let's add NUMERATOR and DENOMINATOR since these are very important words to know about fractions.

2. TEACHER DO: Work with students to develop a definition of numerator and denominator. Then, direct students to record the group's definitions along with examples (of their own) in the Math Vocabulary section of the student book.

STUDENTS DO: Participate in defining "numerator" and "denominator." Record definitions and examples in the Math Vocabulary section using the Fractions anchor chart for support as needed.

TEACHER SAY: **Good work today. In our next class, we will continue to work with number lines and think about how we can use them to compare fractions.**

Lesson 83 Overview

LESSON OVERVIEW

In this lesson, students examine three models for the unit fraction $\frac{1}{4}$ and explain why they all represent $\frac{1}{4}$. This activity helps students understand that $\frac{1}{4}$ may look different depending on the whole, but that $\frac{1}{4}$ always means the whole has been divided into 4 equal parts. Students expand use of the number line model to help compare unit fractions. As they move from concrete models to more abstract models, some students may need additional support and practice. Consider pairing those students with partners who can help them build understanding (without doing the work for them). Students close the lesson by sharing what they have learned about how to use a number line to compare fractions as well as challenges they still face regarding fractions.

LEARNING OBJECTIVES

Students will:

- Locate unit fractions on a number line (0 to 1).
- Compare unit fractions on a number line between 0 and 1.

LESSON PREPARATION FOR THE TEACHER

- Cut strings 20 centimeters in length (one string per student plus one for the teacher).

KEY VOCABULARY

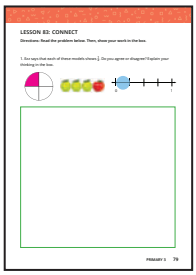
- Comparison
- Greater than
- Less than
- Unit fraction

MATERIALS

- Fractions anchor chart
- Scissors
- Pieces of string (one per student plus one for the teacher)
- Colored pencils or markers
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions



1. TEACHER DO: Have students open the Mathematics Student Book to page Lesson 83: Connect and read the directions silently. Make sure students understand the activity and have them begin working. After 2 to 3 minutes, call on a student who does not agree with Ezz and ask them to explain why. Then, call on a student who agrees and have them explain why. Guide students to use fraction vocabulary, including numerator, denominator, and equal parts.

TEACHER SAY: Fractions can be represented in lots of ways. We have made fraction models, seen pictures, made sets, and made number line models. Each of the "wholes" in the Connect problem has been divided into 4 equal parts with one of the parts being called out in some way, so Ezz is correct.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: We have been using number lines to represent unit fractions. Today our goal is to use number lines to help us compare unit fractions. A few lessons ago, we talked about how the size of the whole matters when comparing the size of fractional parts. For example, is $\frac{1}{2}$ of a watermelon the same as $\frac{1}{2}$ of an orange?

STUDENTS DO: Call out responses.

TEACHER SAY: When we are comparing the sizes of fractional parts, the size of the whole matters. Today when we are looking at unit fractions on a number line, we are going to make sure the size of the "wholes" is the same.

TEACHER DO: Distribute string and scissors to each student.

TEACHER SAY: For this activity, this string is going to represent a number line. Both you and your Shoulder Partner have a piece of string. One of you will cut your string number line into halves. The other will cut your string number line into fourths. How can we cut our string into perfect $\frac{1}{2}$ or $\frac{1}{4}$ pieces without measuring? Raise your hand if you have a strategy that you think will work.

STUDENTS DO: Raise hand to volunteer. Selected students share string-cutting strategies.

TEACHER DO: If no student recommends folding the string, explain the following:

1. Fold the string so that the ends touch.
2. Pull the string tight to identify where the middle of the string is (the point of the fold).
3. Cut the string at the point of the fold to create two halves. (Half the class will be done cutting at this point.)
4. To cut the string into $\frac{1}{4}$ pieces, repeat the folding and cutting process for each $\frac{1}{2}$ piece of string.

STUDENTS DO: One partner cuts the string in half. The other partner cuts the string into fourths.

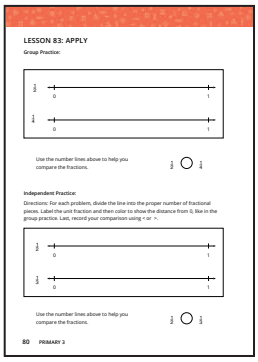
TEACHER DO: As students are cutting, draw two number lines on the board. Label 0 and 1 at the end of each number line. Once students have finished cutting the strings, direct them to lay the strings out one above the other as shown below (different colors are used to show the different pieces of string).

2. TEACHER SAY: Look at your string pieces with your partner. Which is larger, $\frac{1}{4}$ or $\frac{1}{2}$? Talk to your partner and explain how you know which fraction is larger.

STUDENTS DO: Compare the fractional parts and explain thinking to **Shoulder Partner**.

Note to the Teacher: Most students will share that they can see the $\frac{1}{4}$ piece of string is physically smaller than the $\frac{1}{2}$ piece. Others may notice that the $\frac{1}{4}$ is smaller because the whole was cut into more parts, creating smaller pieces. Students who visualize the fractions on the number line may be able to explain that $\frac{1}{4}$ is closer to 0 on the number line, while $\frac{1}{2}$ is closer to 1 than $\frac{1}{4}$ is, making it the larger fraction.

TEACHER DO: Select a volunteer to record the comparison on the board using the greater than or less than sign.


LESSON 83: APPLY

Group Practice:

Use the number lines above to help you compare the fractions.

Independent Practice:

Directions: For each problem, divide the line into the proper number of fractional pieces. Label the unit fraction and then color to show the distance from 0, like in the group practice. Last, record your comparison using < or >.

Use the number lines above to help you compare the fractions.

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3. TEACHER SAY: We used our strings as a kind of number line to help us compare fractions. We can use actual number lines to compare fractions too. Turn to page Lesson 83: Apply in your student book and we will practice that together.

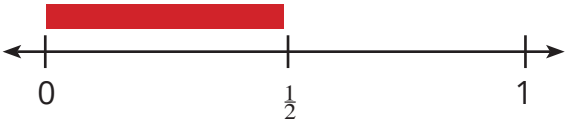
STUDENTS DO: Turn to the Apply page.

TEACHER SAY: In the box, there are two number lines labeled with a 0 at one end and a 1 at the other. Take a moment to divide the first line into halves. Try to get as close to two equal parts as possible. Label $\frac{1}{2}$ on the number line. Give me a Thumbs Up when you are finished.

TEACHER DO: As students work, draw a number line on the board. Label 0 and 1.

STUDENTS DO: Divide the line to show halves. Give a **Thumbs Up** when finished.

TEACHER DO: Ask a volunteer to go to the board and draw a line to divide your number line into two halves. If necessary, help the student get as close to the middle of the line as possible. Ask that student (or another volunteer) to label $\frac{1}{2}$ on the number line. Draw a thick line from 0 to $\frac{1}{2}$ to help students see the size of the fractional part. Example:

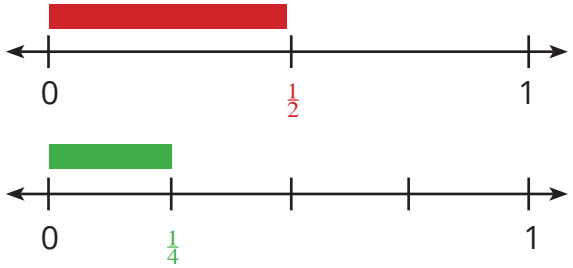


TEACHER SAY: Now, draw lines to show fourths on the second number line. Do your best to divide the line into four equal pieces. Then, label $\frac{1}{4}$ on the number line. Give me a Thumbs Up when you are done.

TEACHER DO: As students work, draw another number line on the board. Label 0 and 1.

STUDENTS DO: Divide the line to show fourths. Give a **Thumbs Up** when finished.

TEACHER DO: Ask a volunteer to go to the board and draw lines to divide your second number line into fourths. If necessary, help the student create four equal pieces (using the first number line as a model, draw a line to mark the $\frac{1}{2}$, then divide each $\frac{1}{2}$ into two equal parts). Ask that student (or another volunteer) to label $\frac{1}{4}$ on the number line. Draw a thick line from 0 to $\frac{1}{4}$ to help students see the size of the fractional part. Example:



TEACHER SAY: Which fraction is larger—$\frac{1}{2}$ or $\frac{1}{4}$?

STUDENTS DO: Call out responses.

TEACHER DO: If some students say $\frac{1}{4}$, ask questions to help them understand why $\frac{1}{2}$ is the larger fraction. Consider asking students to help explain it to each other. Point out that the comparison problem the student volunteer wrote on the board earlier is still true. $\frac{1}{2} > \frac{1}{4}$.

4. TEACHER SAY: Now, it is your turn to try some of these problems. You will make a number line to represent each fraction, and then record your comparison using the greater than or less than symbol. If you finish early, you may try the Challenge problems. Are there any questions?

Note to the Teacher: Consider having some (or all) students work with a partner to complete the Apply learning activity. If students are struggling, having a peer explain the concepts can be helpful.

STUDENTS DO: Ask clarifying questions, if necessary. Work in student book to compare unit fractions using a number line. Students who finish early may work on the Challenge problems.

TEACHER DO: Walk around the class, observing students as they solve the Apply problems. Offer assistance to students who are struggling and note who might need extra support. Ask students to justify answers using the fraction number lines. At the end of Learn, use an **Attention Getting Signal**.

TEACHER SAY: I cannot believe how much you have learned about fractions in such a short amount of time. I know we are still learning, but I love how hard you work. You may put away your student book.

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: Today our goal was to use number lines to compare unit fractions. Think for a moment about how number lines helped you to compare fractions. What was easy to understand? What was challenging? When you are ready to share, give me a Thumbs Up and we will Popcorn around to hear some of your thoughts.

STUDENTS DO: Think about how a number line helped them compare unit fractions and identify what is still challenging for them. Give a **Thumbs Up** when ready. Selected student shares thinking and **Popcorns** to the next student.

TEACHER DO: Confirm accurate thinking and correct misconceptions, if necessary. If students contribute strategies that work every time or ideas that help build understanding of fractions, consider adding them to the Fractions anchor chart. Have students give themselves a pat on the back.

Lesson 84 Overview

LESSON OVERVIEW

Students begin the lesson by conducting an error analysis to review line plots. They then continue to expand understanding of fractions by exploring fractions with numerators greater than 1. They draw examples and use drawn models to compare fractions, deepening understanding of the relationship between the numerator and denominator and the value of the fraction. They close the lesson by developing a class definition of "proper fraction" and recording the new definition.

LEARNING OBJECTIVES

Students will:

- **Model** fractions with numerators greater than 1.

LESSON PREPARATION FOR THE TEACHER

Prior to the lesson, draw a number line model on the board for sixths. Label only the 0 and 1.

KEY VOCABULARY

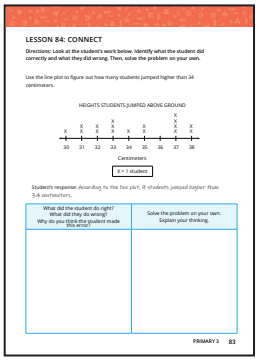
- Greater than
- Key
- Less than
- Line plot
- Numerator
- Proper fraction
- Unit fraction

MATERIALS

- Students' fraction model strips
- Colored pencils or markers
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 84: CONNECT

Directions: Look at the student's work below. Identify what the student did correctly and what they did wrong. Then, solve the problem on your own.

Use the line plot to figure out how many students jumped higher than 34 centimeters.

HEIGHTS STUDENTS JUMPED ABOVE GROUND

Centimeters

X = 1 student

Student's response: According to the line plot, 8 students jumped higher than 34 centimeters.

What did the student do right? What did they do wrong? Why do you think the student made this error?	Solve the problem on your own. Explain your thinking.

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Note to the Teacher: Line plots were introduced earlier in the year, so this should be a review of how to read and interpret them. If students seem to struggle, spend a few minutes reviewing the concept and possibly modeling another line plot, such as a line plot for number of siblings.

1. TEACHER DO: Have students open the Mathematics Student Book to page Lesson 84: Connect and read the directions silently. Once students understand the directions, have them begin working on the error analysis problem. When finished, they should discuss answers and strategy with a **Shoulder Partner**.

Note to the Teacher: Students should recognize that the student in the Connect problem included 34 when they counted 9, but the problem said higher than 34 centimeters.

TEACHER DO: After 3 to 5 minutes, use **Calling Sticks** to choose one or two students to share thinking and explain how they solved the problem.

TEACHER SAY: Great job. Let's continue our work with fractions.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today our learning goal is to explore fractions with numerators greater than 1. These fractions are called proper fractions. PROPER FRACTIONS are fractions that have a numerator that is less than the denominator. Unit fractions are proper fractions since they do have a numerator that is less than the denominator, but there are many other proper fractions. Take out your fraction model strips and lay out the pieces that show $\frac{1}{3}$.

STUDENTS DO: Take out fraction models and lay out the pieces that show thirds.

TEACHER SAY: Hold up $\frac{1}{3}$.

STUDENTS DO: Hold up a $\frac{1}{3}$ piece.

TEACHER SAY: This is $\frac{1}{3}$. It is a unit fraction. Whisper how many of these make up the whole.

STUDENTS DO: Whisper: 3.

TEACHER SAY: Great. Three thirds make up a whole. But what if we have 2 of the thirds pieces? (Hold up 2 of the $\frac{1}{3}$ pieces.) What fraction is this? Lean and Whisper your thinking to your Shoulder Partner. When you think you know, raise your hand.

STUDENTS DO: Lean and Whisper. Raise hand to volunteer. Selected student shares answer, writes it on the board, and explains thinking.

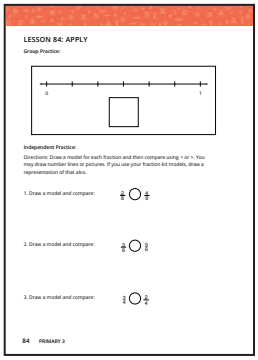
TEACHER DO: Make sure students understand why the fraction is written as $\frac{2}{3}$. For example:

- We have 2 of the thirds pieces, so we write that fraction as $\frac{2}{3}$.
- We have 2 of these parts so the numerator is 2, and it takes 3 to make a whole, so the denominator is 3.

TEACHER SAY: Two-thirds is a proper fraction because the numerator is less than the denominator. But which fraction is larger, $\frac{1}{3}$ or $\frac{2}{3}$? How do you know? Talk with your Shoulder Partner.

STUDENTS DO: Talk to partner about which fraction is larger and explain how they know.

TEACHER DO: Call on students to share answers and explanations. Then, repeat the process with different fraction model strips (for example, $\frac{3}{4}$, $\frac{4}{6}$, and $\frac{2}{8}$). Each time, ask students to first take out the unit fraction, create the proper fraction, and tell a **Shoulder Partner** what they think the name of the fraction is. Then, ask one student to come to the front to say and record the fraction on the board. Discuss which of the two fractions with the same denominator is larger, the unit fraction or the proper fraction. Spend about 10 minutes or until students seem comfortable showing the proper fractions with the models and understanding that the larger fraction has a larger numerator and is closer to creating one whole.


LESSON 84: APPLY

Group Practice:

Independent Practice:

Directions: Draw a model for each fraction and then compare using < or >. You may draw number lines or pictures. If you use your fraction kit models, draw a representation of that also.

1. Draw a model and compare: $\frac{1}{4} \bigcirc \frac{1}{3}$

2. Draw a model and compare: $\frac{1}{3} \bigcirc \frac{1}{6}$

3. Draw a model and compare: $\frac{1}{3} \bigcirc \frac{1}{4}$

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2. TEACHER SAY: Great work using your pieces to show proper fractions that have a numerator greater than 1. Let's take a look at proper fractions on the number line.

TEACHER DO: Have students turn to page Lesson 84: Apply and hold up the number of fingers that equal the number of equal parts on the number line (6).

TEACHER SAY: The number line is broken up into 6 equal pieces, and each piece is $\frac{1}{6}$ of the space between 0 and 1. Please record $\frac{1}{6}$ on the first mark on the number line.

STUDENTS DO: Record $\frac{1}{6}$.

TEACHER DO: Record $\frac{1}{6}$ on the line on the board. Draw a hop line to show that you have "hopped" from 0 to $\frac{1}{6}$.

TEACHER SAY: So if I start at 0, or zero-sixths, and I travel to the first mark, I have gone $\frac{1}{6}$ of

the whole. But what if I travel, or hop, to the next mark on the number line? Where would I land? Put your finger on that mark. Then, raise your hand if you can share what we should label this mark.

STUDENTS DO: Place finger on the $\frac{2}{6}$ mark. Raise hand to volunteer. Selected students share answers.

TEACHER DO: Confirm $\frac{2}{6}$ as the correct answer. Draw another hop to the $\frac{2}{6}$ mark and label $\frac{2}{6}$ on the number line.

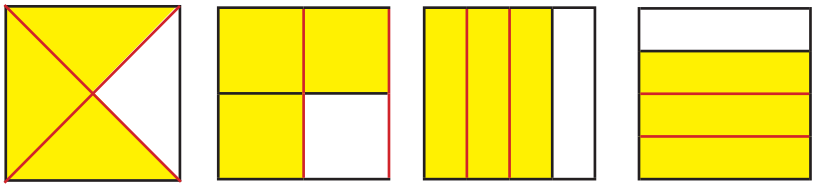
3. TEACHER SAY: Good. We traveled $\frac{2}{6}$ of the whole together. Work with your Shoulder Partner to label the rest of the number line marks.

STUDENTS DO: Work with a partner to label $\frac{3}{6}$, $\frac{4}{6}$, $\frac{5}{6}$, and $\frac{6}{6}$ on the number line.

TEACHER DO: As students are working, use **Calling Sticks** to have students label the number line on the board. As students label each mark in order, draw a hop to represent the distance traveled. The goal is for students to clearly see the 6 equal sections of the number line.

TEACHER SAY: Well done. Let's take a look at a different fraction model. In your book, there is a square. Draw lines to divide the square into fourths. Then, shade in $\frac{3}{4}$ of the square. Raise your hand when you are done.

STUDENTS DO: Draw lines to divide the square in the student book into fourths, and then shade in $\frac{3}{4}$. Raise hand to volunteer. Selected student draws model on the board.



TEACHER DO: Ask if any students drew the model differently, and allow them to show work on the board. Explain to students that there are four ways they could have divided the square, but all of the parts must be equal, and 3 must be shaded in to show $\frac{3}{4}$. Examples:

TEACHER SAY: All of these are models of the proper fraction $\frac{3}{4}$. I am going to draw a model of $\frac{1}{4}$ using a square.

TEACHER DO: Select one of the $\frac{3}{4}$ models. Create the same model, but shade in $\frac{1}{4}$.

TEACHER SAY: Look at these two models. Both of them are showing fourths. How is $\frac{3}{4}$ different from $\frac{1}{4}$? How is $\frac{3}{4}$ similar to $\frac{1}{4}$? Turn and Talk to your Shoulder Partner. Use the words numerator and denominator in your discussion. Give me a Thumbs Up when you are ready to share your ideas.

STUDENTS DO: Work with partner to compare the two fractions. Use the terms numerator and denominator to describe similarities and differences. Give a **Thumbs Up** to volunteer. Selected students share ideas with the class.

Note to the Teacher: Students should note that $\frac{3}{4}$ is a larger fraction than $\frac{1}{4}$. Some students may also note the following:

- *When two fractions have the same denominator, the larger the numerator, the larger the fraction.*
- *As the numerator increases, the fraction gets closer to being one whole.*

4. TEACHER DO: Confirm students' accurate observations and correct major misconceptions. When students are ready to move on, have them work independently or with a partner to complete the remainder of the Apply page. Encourage students who finish early to try the Challenge problem.

STUDENTS DO: Work on the fraction problems, drawing models and comparing fractions. Students who work independently should check work with a partner when they are finished. Students who finish early may try the Challenge problem.

TEACHER DO: Walk around the room, observing students as they work. Make note of students who seem to struggle modeling different proper fractions and offer assistance as needed. At the end of Learn, use an **Attention Getting Signal**.

TEACHER SAY: **Please keep your student book out for Reflect.**

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: **Today we looked at fractions with numerators greater than 1. You learned the term PROPER FRACTION. Please turn to the Math Vocabulary section of your student book.**

STUDENTS DO: Turn to the vocabulary page.

TEACHER DO: Work with students to create a definition of proper fraction. Write the class' definition on the board, and then have students copy it into the student books. Encourage students to include examples with the definition. Add the definition and some examples to the Fractions anchor chart.

Lesson 85 Overview

LESSON OVERVIEW

Students begin this lesson by reviewing expanded notation with an error analysis problem. These reviews are important in helping students retain previously learned skills and concepts. In Learn, students are challenged to create and label a number line, identify the location of a given fraction on the number line, and draw a model of the given fraction using shapes or sets. Finally, they take time to reflect on what they have learned about fractions and collaborate to expand and enhance the class Fractions anchor chart.

LEARNING OBJECTIVES

Students will:

- Express a given number in expanded form.
- Divide a number line into a given number of equal parts.
- Locate proper fractions on a number line.
- Draw models of fractions using shapes or sets.

LESSON PREPARATION FOR THE TEACHER

- Display the Fractions anchor chart where all students can see.

KEY VOCABULARY

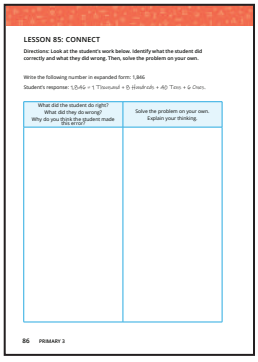
Review previous vocabulary as needed.

MATERIALS

- Fractions anchor chart
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 85: CONNECT

Directions: Look at the student's work below. Identify what the student did correctly and what they did wrong. Then, solve the problem on your own.

Write the following number in expanded form: 1,846

Student's response: 1,846 = 1 Thousand + 8 Hundreds + 40 Tens + 6 Ones.

What did the student do right? What did they do wrong? Why do you think the student made this error?	Solve the problem on your own. Explain your thinking.

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Note to the Teacher: This is a review of expanded notation. Take note of students who may need additional practice.

1. TEACHER DO: Have students open the Mathematics Student Book to page Lesson 85: Connect and read the directions silently. Once you are sure students understand the directions, have them begin working on the error analysis problem. When they are finished, they should check work with a **Shoulder Partner**. After 3 to 5 minutes, call on students to explain the student's error and share answers. Students should note that the error was writing 40 Tens instead of 4. If time allows, write a few more numbers on the board and have students turn to a **Shoulder Partner** to express the numbers in expanded form (orally). Ask volunteers to share answers with the class. Examples:

- 496
- 2,475
- 3,109

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today your goal is to locate proper fractions on a number line.

TEACHER DO: Call on students to explain unit fractions and proper fractions and provide examples. Confirm correct answers and correct students' misconceptions.

TEACHER SAY: Today we will practice putting proper fractions on a number line.

TEACHER DO: Draw the number line below on the board.

TEACHER SAY: A student said that this number line is divided into halves because there are two lines drawn on the number line. Is the student correct? Talk to your Shoulder Partner. When you have an answer, give me a Thumbs Up.

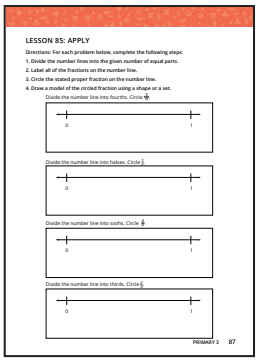
STUDENTS DO: Talk to partners about the number line. Give a **Thumbs Up** when they are ready. Selected students share thinking with the class.

TEACHER DO: If necessary, use the fraction strips as a model to match the cuts from the paper to the lines on the number line. Call on volunteers to write fractions on the number line. If students are ready for a challenge, give them the fractions out of order and ask them to label them on the number line. For example, you could begin with $\frac{2}{3}$, and then continue with $\frac{0}{3}$, $\frac{3}{3}$, and $\frac{1}{3}$.

TEACHER SAY: When we use number lines to show fractions, it is important that the lines breaking up the parts are equally spaced. Why do you think that matters? Talk to your Shoulder Partner and then raise your hand when you have an idea.

STUDENTS DO: Talk to partners about the importance of equal spacing. Raise hands when ready to share. Selected students explain thinking.

TEACHER DO: Confirm correct answers and correct students' misconceptions.


LESSON 85: APPLY

Directions: For each problem below, complete the following steps:
1. Divide the number lines into the given number of equal parts.
2. Label all of the fractions on the number line.
3. Circle the stated proper fraction on the number line.
4. Draw a model of the circled fraction using a shape or a set.

Divide the number line into fourths. Circle $\frac{3}{4}$.

Divide the number line into halves. Circle $\frac{1}{2}$.

Divide the number line into sixths. Circle $\frac{5}{6}$.

Divide the number line into thirds. Circle $\frac{2}{3}$.

PRIMARY 2 87

TEACHER SAY: Please open your student book to page Lesson 85: Apply and read the directions silently.

STUDENTS DO: Turn to the Apply page and read the directions.

TEACHER DO: Work with students to complete the first problem together. Remind students to draw lines carefully to create equal sections on the number line. Once students understand the directions and correctly complete the first problem, have them work independently to complete the remainder of the learning activity. Encourage students who finish early to try the Challenge problem. Walk around and observe students as they work. Take note of students who are struggling. Consider pairing them with a partner who can help them build understanding of fractions on the number line. At the end of Learn, use an **Attention Getting Signal**.

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: We have done a lot of work to learn about fractions—what they are, how to model them, how to read and write them, how to show them on a number line, and how to compare them. Let's take a moment to make sure our Fractions anchor chart reflects everything we have learned.

TEACHER DO: Work with students to identify and add new information to the class Fractions anchor chart.

STUDENTS DO: Identify and share information they have learned about fractions to add it to the Fractions anchor chart.

Lesson 86 Overview

LESSON OVERVIEW

Students begin this lesson by applying understanding of fractions on a number line to practice counting forward and backward. They apply understanding of proper fractions as they play a partner game that challenges them to read and write proper fractions. Students synthesize learning to respond to a journal prompt that asks them to compare unit fractions and proper fractions, providing examples and models to support their thinking.

LEARNING OBJECTIVES

Students will:

- Count forward and backward by fractions.
- Read and write proper fractions.
- Compare unit and proper fractions.

LESSON PREPARATION FOR THE TEACHER

- Print and cut out sets of the Fraction Game cards (one set per pair of students). See the Fraction Game Cards Blackline Master. See Chapter Preparation for Lesson 86 for detailed instructions.

KEY VOCABULARY

Review previous fraction vocabulary.

MATERIALS

- Fractions anchor chart
- Fraction Game cards (one set of cards for each pair of students)
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions

1. TEACHER SAY: For Connect today, we are going to count forward and backward, not by whole numbers, but by fractions. In our last math lesson, we explored fractions that had a numerator greater than 1. We drew models of proper fractions and looked at them on a number line. Today we are going to practice counting by fractions up to one whole and then back down to zero. I will give an example.

TEACHER DO: Write the fractions on the board as you count them aloud.

TEACHER SAY: If I was going to count by halves, I could say, "Zero halves (or zero), one-half, two halves (or one)."

TEACHER DO: Model counting backward by halves, then have students count by thirds with you as you write the fractions on the board. If possible, have student volunteers stand with you to lead the count.

STUDENTS DO: Count aloud by fractions with the teacher. Selected students lead the count at the front of the room.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today our learning goal is to practice writing and reading a variety of proper fractions, or fractions that have a numerator less than the denominator. I wonder, what do we call a fraction that has a numerator that is the same as the denominator? Give me a Thumbs Up if you would like to share your idea.

STUDENTS DO: Give a **Thumbs Up** to volunteer. Select students share thinking.

TEACHER DO: Confirm the correct answer: 1 or one whole.

TEACHER SAY: Proper fractions are less than one whole. In our last class, we practiced comparing some proper fractions with the same denominator and drew models. Remember that proper fractions can also be a fraction of a set. Let's play a quick game to show what we know about proper fractions. I am going to call up some students.

TEACHER DO: Choose two girls and one boy to stand at the front of the room.

TEACHER SAY: How many students are in this set of students? Hold up your fingers.

STUDENTS DO: Hold up 3 fingers.

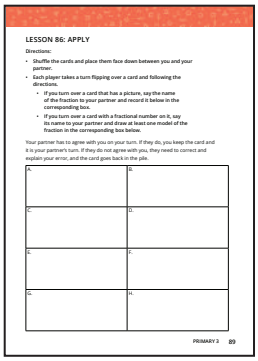
TEACHER SAY: What fraction of this set is girls? Whisper in your hand.

STUDENTS DO: Whisper answers into hands.

TEACHER SAY: If you said that $\frac{2}{3}$ of the set are girls, you are correct. $\frac{2}{3}$ is a proper fraction. Let's play again.

TEACHER DO: Repeat the process, choosing a different number of students for the set and looking at different characteristics. Some examples include:

- 4 students in the set (3 are wearing red and 1 is wearing green). Ask students what fraction of the set are wearing green. What fraction are wearing red?
- 6 students in the set (some wearing sneakers and others wearing a different type of shoe). Ask, "What fraction are wearing sneakers?"


LESSON 86: APPLY

Directions:

- Shuffle the cards and place them face down between you and your partner.
- Each player takes a turn flipping over a card and following the directions.
  - If you turn over a card that has a picture, say the name of the fraction to your partner and record it below in the corresponding box.
  - If you turn over a card with a fractional number on it, say its name to your partner and draw at least one model of the fraction in the corresponding box below.

Your partner has to agree with you on your turn. If they do, you keep the card and it is your partner's turn. If they do not agree with you, they need to correct and explain your error, and the card goes back in the pile.

A. B. C. D. E. F. G. H.

PRIMARY 3 89

Each time, record the proper fraction on the board or have a student do so.

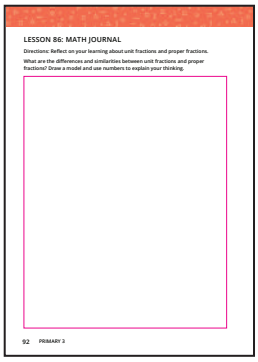
2. TEACHER SAY: Great work. Today you are going to play a game with a partner. You will use a deck of fraction cards and your student book. Please open your book to page Lesson 86: Apply and read the directions to yourself.

STUDENTS DO: Open student book to the Apply page and read the directions silently.

TEACHER DO: Once students understand the directions, have them do **Hands Up Pair Up**, distribute the cards to partners, and have them begin playing. Encourage students who finish early to try the Challenge problems. Walk around the class, observing students as they play the game. When Learn is almost over, use an **Attention Getting Signal**. Have students store the cards and then collect the decks.

Reflect (5 to 10 minutes)

Directions


LESSON 86: MATH JOURNAL

Directions: Reflect on your learning about unit fractions and proper fractions.

What are the differences and similarities between unit fractions and proper fractions? Draw a model and use numbers to explain your thinking.

92 PRIMARY 3

1. TEACHER DO: Have students turn to page Lesson 86: Math Journal and read the directions silently. Make sure students understand the prompt and then have them begin working.

STUDENTS DO: Turn to the journal page and read the directions silently.

TEACHER DO: Be sure to collect students' journals to read responses, which will provide valuable information about students' current understanding of unit fractions and proper fractions.

Lesson 87 Overview

LESSON OVERVIEW

In this lesson, students work on a challenging question during Connect about different ways shapes can be divided into fractionally fair shares. In Learn, they compare fractions with the same numerator and fractions with the same denominator. They develop and test a hypothesis for comparing fractions and share understanding in a journal entry at the end of the lesson.

LEARNING OBJECTIVES

Students will:

- Compare two fractions with the same denominator.
- Compare two fractions with the same numerator.
- Explain how to compare fractions.

LESSON PREPARATION FOR THE TEACHER

No additional preparation needed.

KEY VOCABULARY

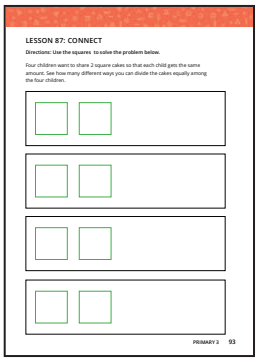
- Hypothesis

MATERIALS

- Fraction models—teacher set and student sets
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 87: CONNECT

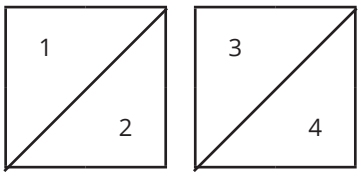
Directions: Use the squares to solve the problem below.

Four children want to share 2 square cakes so that each child gets the same amount. See how many different ways you can divide the cakes equally among the four children.

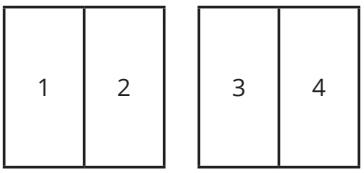
PRIMARY 2 93

1. TEACHER DO: Have students take out the Mathematics Student Book and turn to page Lesson 87: Connect and read the directions to themselves. Give students about 5 to 7 minutes to solve the Connect problem. Then, go over the answers as a class. Ask students to come to the board and draw their thinking. Possible solutions include:

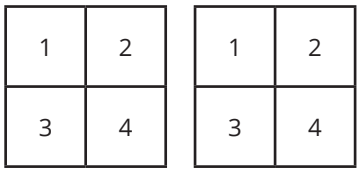
Solution A



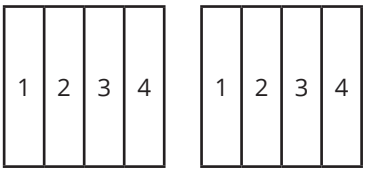
Solution B



Solution C



Solution D

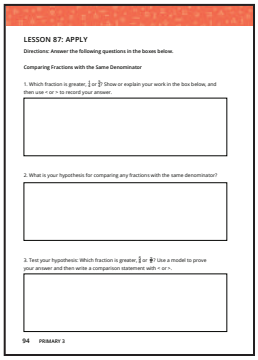


Note to the Teacher: Equivalent fractions have not been taught but can be examined if it comes up. This Connect can be used to review and discuss the following ideas:

- *Fraction names: What fraction of the cake is one piece? How do you know?*
- *Meaning of fractions: For solution C, we decided that each child gets $\frac{2}{4}$ of a cake. What do you think the numerator means? What do you think the denominator means?*
- *Different shaped pieces can be the same fraction if they are the same size in relation to the whole: Are the one-half-size pieces for solutions A and B the same size or different sizes? How can we prove it?*
- *Equivalent fractions: We got two answers—$\frac{1}{2}$ and $\frac{2}{4}$. Are these fractions showing the same amount or different amounts of a cake? How can we prove it? Do $\frac{1}{2}$ and $\frac{2}{4}$ mean the same thing?*

Learn (35 to 45 minutes)

Directions


LESSON 87: APPLY

Directions: Answer the following questions in the boxes below.

Comparing Fractions with the Same Denominator

1. Which fraction is greater, $\frac{1}{4}$ or $\frac{3}{4}$? Show or explain your work in the box below, and then use < or > to record your answer.

2. What is your hypothesis for comparing any fractions with the same denominator?

3. Test your hypothesis: Which fraction is greater, $\frac{1}{4}$ or $\frac{3}{4}$? Use a model to prove your answer and then write a comparison statement with < or >.

94 PRIMARY 2

1. TEACHER SAY: Today our learning goal is to answer an Essential Question about fractions. The question is: How do we compare fractions? Who can remind us how we have used the word "compare" in math? What does it mean to compare fractions?

STUDENTS DO: Raise hand to volunteer. Selected students share thinking.

TEACHER DO: Have students turn to page Lesson 87: Apply and take out fraction strips and circles. Direct students to work with a **Shoulder Partner** to solve the first problem in the book.

After 4 to 5 minutes, call on students to share answers and explain thinking. If students draw models, remind them that the whole needs to be the same size. Confirm that $\frac{3}{4} > \frac{1}{4}$.

2. TEACHER SAY: Let's make a hypothesis about comparing two fractions with the same denominator. A HYPOTHESIS is an educated guess. Think about what you know about fractions and the first problem we just did. In box 2, write down your hypothesis on how to compare two fractions with the same denominator. Use math vocabulary in your hypothesis. When you have finished writing your hypothesis, test it in boxes 3 and 4 to see if your hypothesis is correct.

STUDENTS DO: Develop and record a hypothesis for comparing two fractions with the same denominator. Test hypothesis to see if it is correct.

TEACHER DO: Give students 5 to 8 minutes to work. Use an **Attention Getting Signal** to bring the class back together and have students briefly discuss whether they proved the hypothesis.

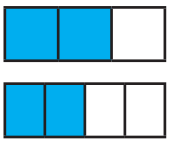
TEACHER SAY: What if a fraction has the same numerator but a different denominator? How do you determine which fraction is greater? Share your thinking with your Shoulder Partner.

STUDENTS DO: Talk to partner about how to compare fractions with the same numerator but a different denominator.

3. TEACHER SAY: Work with your Shoulder Partner on problem 5. Remember, prove what you are saying by using your fraction models or by creating drawings.

STUDENTS DO: Work with partner to solve problem 5.

TEACHER DO: After a few minutes, call on students to share answers, explain thinking, and show work. If students are struggling, draw a model or use the fraction strips or circles to show that $\frac{2}{3}$ is larger than $\frac{2}{4}$.



4. TEACHER SAY: Now, make a hypothesis now about how we compare fractions when the numerator is the same, but the denominator is different. Write down your hypothesis in your student book. When you have finished writing your hypothesis, test it with problems 7 and 8.

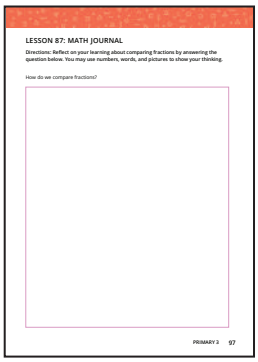
STUDENTS DO: Develop and record a hypothesis for comparing two fractions with the same denominator. Test hypothesis to see if it is correct.

TEACHER DO: Give students 3 to 5 minutes to work. Then, call on students to share answers, explain thinking, and show work.

TEACHER SAY: Please keep your student book out for Reflect.

Reflect (5 to 10 minutes)

Directions


LESSON 87: MATH JOURNAL

Directions: Reflect on your learning about comparing fractions by answering the question below. You may use numbers, words, and pictures to show your thinking.

How do we compare fractions?

PRIMARY 2 97

1. TEACHER SAY: Turn to page Lesson 87: Math Journal in your student book.

STUDENTS DO: Turn to the journal page.

TEACHER SAY: Our goal today was to answer the Essential Question: How do we compare fractions? Use what you know about comparing fractions—whether they have the same numerator or the same denominator—to answer the question.

STUDENTS DO: Work independently to write an answer to the Essential Question.

TEACHER DO: Be sure to collect students' books and read the journal entries. The entries will provide valuable information about students' understanding of how to compare fractions with the same numerator or the same denominator.

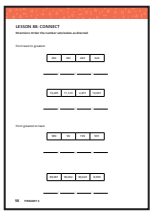
Lesson 88 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students begin by reviewing ordering numbers with place value up to 10,000. Now that they have a deep understanding of fractions, they are ready to move on to solving fraction addition problems using fraction model kits and by drawing models. Throughout Learn and Reflect, students work to understand why adding fractions requires a common denominator.	Students will: • Order four numbers from least to greatest or greatest to least. • Add two fractions with the same denominator. • Explain the importance of common denominators when adding fractions.	• Add • Common • Sum

LESSON PREPARATION FOR THE TEACHER	MATERIALS
• No additional preparation needed.	• Fraction model strips and circles—teacher set and student sets • Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions



1. TEACHER DO: Have students open the Mathematics Student Book to page Lesson 88: Connect and read the directions silently. Once students understand the directions, have them begin working independently to complete the review activity. Remind students to carefully read the directions for each set of numbers. After 3 to 5 minutes, go over the answers together. Call on students to share answers and explain how they solved the problem. If not mentioned, remind students that the most effective strategy is to start by looking at the number in the greatest place value, the digit furthest left, and then compare.

Learn (35 to 45 minutes)

Directions

1. TEACHER DO: Draw the following on the board:

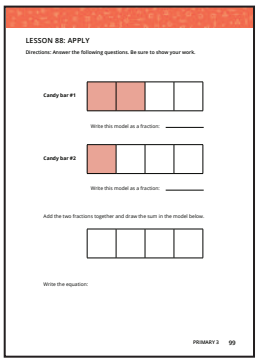
TEACHER SAY: You have become experts at reading and writing fractions and finding them on a number line. Now you are ready for the next challenge. Our learning target today is to add fractions with the same denominator. I have drawn two candy bars on the board. I have $\frac{2}{3}$ of one candy bar and $\frac{5}{8}$ of the other. If I had these two candy bars in my hand, I could stick them together, but then what would I call the pieces—thirds or eighths? If I wanted to write a math problem for these fractions, could I solve it? Share your thinking with your Shoulder Partner.

TEACHER DO: Write $\frac{2}{3} + \frac{5}{8} =$ _____ on the board.

STUDENTS DO: Share thinking with partners.

TEACHER DO: Call on students to share ideas with the class.

Note to the Teacher: Students must understand that these candy bars cannot be added together because they are cut into different size pieces.


LESSON 88: APPLY

Directions: Answer the following questions. Be sure to show your work.

Candy bar #1

Write this model as a fraction: _____

Candy bar #2

Write this model as a fraction: _____

Add the two fractions together and draw the sum in the model below.

Write the equation:

PRIMARY 3 99

2. TEACHER SAY: Now, what if I had two candy bars that were divided into fourths? Turn to page Lesson 88: Apply and look at the first problem.

STUDENTS DO: Turn to the Apply page and look at the first problem.

TEACHER SAY: Can we add these two fractions of candy bars together? Give me a Thumbs Up to share your thinking.

STUDENTS DO: Give a **Thumbs Up** to volunteer. Selected students share ideas with the class.

TEACHER DO: Have students identify the denominator for both candy bars (4) and then write the fraction for each.

TEACHER SAY: These two fractions have the same denominator. Another way to say that is COMMON denominators. They have common denominators.

STUDENTS DO: Write $\frac{2}{4}$ and $\frac{1}{4}$ in the student book.

TEACHER SAY: Now, we want to add these two fractions together. Turn and Talk to your Shoulder Partner about what you think the answer to $\frac{2}{4}$ plus $\frac{1}{4}$ might be.

STUDENTS DO: Talk to partners.

TEACHER DO: Give students 1 to 2 minutes to discuss answers. Then, call on several students to share thinking with the class. The most common misconception is that the answer will be $\frac{3}{8}$. Explain to students that the sizes of the pieces (denominator) does not change, only the number of pieces (numerator).

3. TEACHER SAY: Let's double-check this work with our fraction strips. I have pulled out my fourths set and my one-whole strip. First, I have $\frac{2}{4}$.

TEACHER DO: Hold up $\frac{2}{4}$.

TEACHER SAY: Let's put it on the one-whole strip because this fraction is still representing $\frac{2}{4}$ of a whole.

TEACHER DO: Place $\frac{2}{4}$ on the one-whole strip.

TEACHER SAY: Then, I want to add $\frac{1}{4}$.

TEACHER DO: Add the $\frac{1}{4}$ strip to the strips on the one-whole strip.

TEACHER SAY: Now, let's count the number of fourths we have. Count with me.

TEACHER DO: Point to the fourths strips and count $\frac{1}{4}$, $\frac{2}{4}$, and $\frac{3}{4}$ aloud. Write on the board: $\frac{2}{4} + \frac{1}{4} = \frac{3}{4}$

TEACHER SAY: Yes, we have $\frac{3}{4}$. Raise your hand if you can explain why the denominator stays the same.

STUDENTS DO: Raise hand to volunteer. Selected students share thinking.

TEACHER DO: Call on students to share ideas with the class. The students should recognize that the size of the pieces of the candy bar did not change, so the denominator does not change.

TEACHER SAY: At the bottom of the first box in your student book, let's draw our fraction sum, or total, in the model and write an equation to show the work.

STUDENTS DO: Draw the fraction sum and record the equation.

4. TEACHER DO: Have students work independently to complete the rest of the addition problems. If necessary, they may use fraction strips or draw models. Encourage students who finish early to try the Challenge problem. As students work, walk around to observe progress. Offer assistance as needed and take note of students who will need additional instruction and practice.

Reflect (5 to 10 minutes)

Directions


LESSON 88: MATH JOURNAL

Directions: Reflect on your learning about adding fractions. Answer the question below. You may use words, numbers, and pictures to show your thinking.

Why can we only add fractions that have the same denominator?

102 PRIMARY 3

1. TEACHER DO: Have students turn to page Lesson 88: Math Journal and read the journal prompt to themselves. Once you are sure they understand the directions, have them begin working on journal entries. Be sure to collect students' books and read the journal entries to assess progress.

Lesson 89 Overview

LESSON OVERVIEW

In this lesson, students begin with an error analysis of a common mistake made when adding fractions. Students then use fraction models and drawings to subtract fractions with the same denominator. They conclude the lesson by expressing in writing what they have learned about adding and subtracting fractions. All of the learning activities in this lesson are designed to confirm students' understanding and reinforce learning.

LEARNING OBJECTIVES

Students will:

- Subtract fractions with the same denominator.
- Explain how to add and subtract fractions with common denominators.

LESSON PREPARATION FOR THE TEACHER

No additional preparation needed.

KEY VOCABULARY

- Common
- Difference
- Subtract

MATERIALS

- Fraction model strips and circles—teacher set and student sets
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions

1. TEACHER DO: Have students open the Mathematics Student Book to page Lesson 89: Connect. Select a volunteer to read the question aloud. Give students 3 to 5 minutes to work on the problem. Then, call on several students to share work with the class.

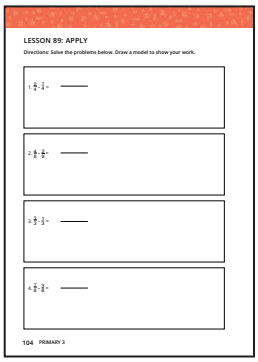
TEACHER SAY: Great job using what you have learned about adding fractions. When you can identify errors, you help yourself learn better.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today's math goal is for you to subtract fractions with the same denominator. Using your fraction models, please take out your fourths. You may use your strips or circles.

STUDENTS DO: Take out fourths.


LESSON 89: APPLY

Directions: Solve the problems below. Draw a model to show your work.

104 PRIMARY 3

TEACHER SAY: Turn to page Lesson 89: Apply and see if you can try the first problem by yourself.

STUDENTS DO: Turn to the Apply page and solve problem 1.

TEACHER DO: Give students 2 to 3 minutes to solve the problem. Then, call on students to share thinking. Ask them questions such as:

- How did you use the fraction models to solve this problem?
- How can you show subtraction of fractions with a drawing?
- How is subtracting fractions similar to adding fractions?
- Do the two fractions have to have a common denominator? Why?

If they are unclear on any of these questions, review the work from the last class and remind them that the denominator stays the same because the size of the pieces (or amount the whole is divided into) stays the same.

2. TEACHER SAY: Nice job. Please continue to solve the problems in your student book. You can check your answers with your Shoulder Partner as you work. Remember to use your fractions models, a number line, or draw a model so you can see how subtraction with fractions works. If you finish before others, work on the Challenge problem.

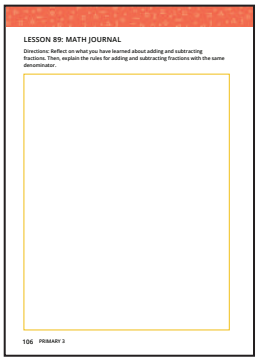
STUDENTS DO: Work independently to solve the Apply problems. Check work with a partner.

TEACHER DO: Monitor students as they work. Take note of students who need additional support. At the end of Learn, use an **Attention Getting Signal**.

TEACHER SAY: Please keep out your books for Reflect.

Reflect (5 to 10 minutes)

Directions


LESSON 89: MATH JOURNAL

Directions: Reflect on what you have learned about adding and subtracting fractions. Then, explain the rules for adding and subtracting fractions with the same denominator.

106 PRIMARY 3

1. TEACHER DO: Have students turn to page Lesson 89: Math Journal and read the journal prompt silently. Make sure students understand the directions and then direct them to begin working. Collect students' books to read the journal entries. Students should be able to articulate that the denominator always stays the same because the size of the piece of the fraction stays the same but the number of pieces changes.

Lesson 90 Overview

LESSON OVERVIEW

In this lesson, students begin with a review of division and fact families. They then work to solve a combination of addition, subtraction, and comparison fraction problems. These problems are purposefully mixed up in the student book so students have to slow down and think about what each problem is asking. Finally, students are asked to try writing an original fraction story problem. This will be a challenge for students and will also serve as an informal assessment to see how well they have understood this new learning.

LEARNING OBJECTIVES

Students will:

- Apply understanding of fractions to solve real-world problems.
- Write a real-world story problem involving fractions.

LESSON PREPARATION FOR THE TEACHER

No additional preparation needed.

KEY VOCABULARY

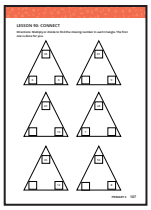
Review previous vocabulary as needed.

MATERIALS

- Fraction model strips and circles—teacher set and student sets
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

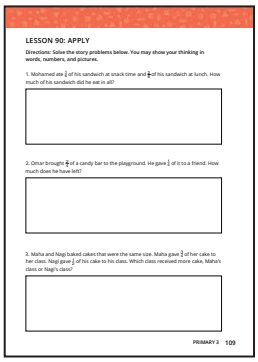
Directions



1. TEACHER DO: Have students turn to page Lesson 90: Connect in the Mathematics Student Book. Ask for volunteers to explain the relationship between the three numbers in the triangle. If no students remember, ask them to think about what operation (or operations) the triangles might represent. Some students may recognize the multiplication relationship, while others may recognize the division relationship. Students may use either to solve the problems and record the missing factor. Have students complete the review activity independently. Students who finish early can try the Challenge problem. When there are a few minutes left in Connect, go over the answers together.

Learn (35 to 45 minutes)

Directions


LESSON 90: APPLY

Directions: Solve the story problems below. You may show your thinking in words, numbers, and pictures.

1. Mohamed ate $\frac{1}{4}$ of his sandwich at snack time and $\frac{2}{4}$ of his sandwich at lunch. How much of his sandwich did he eat in all?

2. Omar brought $\frac{4}{6}$ of a candy bar to the playground. He gave $\frac{2}{6}$ of it to a friend. How much does he have left?

3. Maha and Nagi baked cakes that were the same size. Maha gave $\frac{2}{3}$ of her cake to her class. Nagi gave $\frac{2}{6}$ of his cake to his class. Which class received more cake, Maha's class or Nagi's class?

PRIMARY 3 109

1. TEACHER SAY: Our learning goal for today is to apply your understanding of fractions to real-word problems. You have learned how to add, subtract, and compare fractions, and today you will be doing all three to solve story problems. For each story problem, you will need to stop and think about what the question is asking. You will also need to explain your answer. You can use your fraction strips or circles, make a number line, or draw a model to help you. These problems are challenging, so you will get to work with your Shoulder Partner. Please open your student book to page Lesson 90: Apply and read the directions to yourself.

TEACHER DO: Select a volunteer to read the directions aloud. Once students understand the activity, have them begin working. Walk around the room as they work with partners, listening to conversations and checking for understanding. Five minutes before the end of Learn, use an **Attention Getting Signal**. Go over the answers together.

2. TEACHER SAY: Please take a moment and circle the problem you thought was the most challenging and put a rectangle around the problem you thought was the easiest.

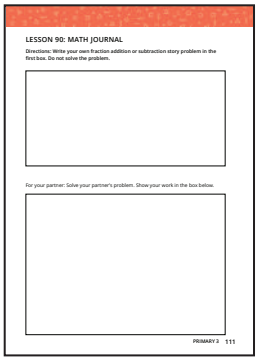
STUDENTS DO: Mark the problems they found most challenging and easiest to solve.

TEACHER DO: Call on several students to share thinking and explain why they thought certain problems were difficult or easy.

TEACHER SAY: **Thank you for noting and sharing your successes and challenges. Please keep your student book out for Reflect.**

Reflect (5 to 10 minutes)

Directions


LESSON 90: MATH JOURNAL

Directions: Write your own fraction addition or subtraction story problem in the first box. Do not solve the problem.

For your partner: Solve your partner's problem. Show your work in the box below.

PRIMARY 3 111

1. TEACHER SAY: **Turn to page Lesson 90: Math Journal in your book. Write your own fraction addition or subtraction story problem. You will have about 3 minutes.**

STUDENTS DO: Write original fraction story problems.

TEACHER DO: After about 3 minutes, have students trade books with a **Shoulder Partner** and solve each other's story problem. If time allows, call on several students to share the problem their partner wrote along with its solution.

TEACHER SAY: **You all have been working hard on understanding how to solve fraction addition, subtraction, and comparing story problems. I am very proud of you. Well done.**

PRIMARY 3

Mathematics

COMMUNICATION

CONNECTIONS

Chapter 4

Lessons 91 to 100

Chapter Overview

Chapter 4: Lessons 91 to 100

In the first chapter of the last theme of Primary 3, students continue to develop their understanding of fractions. Expanding on prior learning, students now explore equivalency. This concept was introduced previously with students learning that 0 and 1 can be written as fractions. Exploration continues in this chapter using $\frac{1}{2}$ as a benchmark fraction. Using $\frac{1}{2}$ as a benchmark gives students a comfortable and familiar starting place from which they can investigate the concepts of equivalent fractions.

Students continue to use fraction models as concrete representations of fractions as quantities and as parts of a whole. During the first few lessons, students develop an understanding of the numeric patterns in equivalent fractions. The last part of this chapter returns to other key concepts of Primary 3, namely division and multiplication. In the last lesson, students reinforce their understanding of the connection between multiplication and division as they demonstrate greater fluency with these operations.

COMPONENT	DESCRIPTION	LESSONS
Connect	During this daily routine, students build fluency in previously learned skills, make connections between prior learning and the upcoming Learn segment, and discuss mathematics concepts. Students may be introduced to an engaging, real-world math problem that establishes a purpose for learning a new skill or concept.	10 to 15 minutes
Learn	During this daily routine, students learn and apply various math skills and concepts. Students engage in exploration, experimentation, problem-solving, collaboration, and discussion to build understanding and application of new skills and concepts and make connections to prior learning. Students learn to think and work like mathematicians and persevere in developing foundational understanding of challenging skills and concepts.	35 to 45 minutes
Reflect	During this daily routine, students develop the ability to express mathematical ideas by talking about discoveries, using math vocabulary, asking questions to make sense of learning tasks, clarifying misconceptions, and learning to see things from peers' perspectives.	5 to 10 minutes

Learning Indicators

Throughout Lessons 91 to 100, students will work toward the following learning indicators:

B. OPERATIONS AND ALGEBRAIC THINKING:

1.a. Explain products of whole numbers.
1.b. Explain quotients of whole numbers.
1.c. Multiply and divide within 100.
1.d. Use strategies to solve multiplication and division problems, including:
- **1)** Manipulatives
- **2)** Drawings
- **3)** Arrays
- **4)** The relationship between multiplication and division

C. NUMBERS AND OPERATIONS IN BASE TEN:

3.a. Describe a proper fraction $1/b$ as the quantity formed by 1 part when a whole is partitioned into b equal parts.
3.b. Read and write proper fractions.
3.d. Demonstrate understanding that two fractions are equivalent (equal) if they are the same size or at the same point on a number line.
3.e. Demonstrate understanding that the proper fraction b/b is equal to one whole.
3.f. Identify and generate simple equivalent fractions.
3.g. Explain why the fractions are equivalent verbally or by using fraction models.
3.h. Demonstrate understanding that comparisons of fractions are valid only if the wholes are the same.

CH 4 Pacing Guide

LESSON	INSTRUCTIONAL FOCUS
91	Students will: • Use fraction models to find fractions equivalent to $\frac{1}{2}$.
92	Students will: • Use drawings and number lines to find equivalent fractions. • Explain which model they prefer to use to find equivalent fractions.
93	Students will: • Use concrete models to identify equivalent fractions other than $\frac{1}{2}$.
94	Students will: • Analyze errors to identify quadrilaterals. • Match equivalent fractions. • Explain why two fractions are or are not equivalent. • Define the term equivalent.
95	Students will: • Find equivalent fractions. • Describe patterns and relationships between numerators and denominators in equivalent fractions.
96	Students will: • Solve story problems involving fraction concepts. • Use a number line to generate and show equivalent fractions.
97	Students will: • Analyze errors to build understanding of volume. • Apply understanding of equivalent fractions to solve story problems. • Describe real-life applications of fractions and equivalent fractions.
98	Students will: • Calculate the area and perimeter of rectangles. • Solve division story problems. • Discuss the relationship between fractions and division.
99	Students will: • Analyze errors to solve a division problem. • Solve division story problems. • Write a story problem to fit a given context. • Describe real-life applications of division.
100	Students will: • Investigate different ways to divide 24 evenly. • Find the missing factor in a fact family. • Write multiplication and division equations to represent fact families. • Explain the relationship between multiplication and division.

Chapter Preparation for Teacher

For Lesson 91:

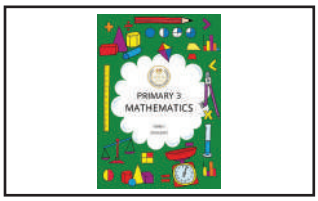
- Print out the Twelfths Fraction Model—Student Strips Blackline Master. Cut each document to create five fraction model strips. Each student will need one strip to label, color, and cut apart.
- Print and cut out one copy of the Twelfths Fraction Model—Teacher Strips Blackline Master.

For Lesson 94:

- Print the Fraction Matching Cards Blackline Master to create one set of cards for each pair of students.
  - One page of the Blackline Master equals four sets of cards.
  - If possible, print on sturdy paper or glue onto construction paper and store for future use.

Materials Used

Student book



Pencil

Chart paper or large white construction paper

Scissors

Crayons or colored pencils

Fraction Matching Cards sets (one set per pair of students)

Twelfths Fraction Model—Student and Teacher Strips (one strip per student)

Fraction model strips—student sets and teacher set

Fractions anchor chart

Lesson 91 Overview

LESSON OVERVIEW

This lesson begins with students reviewing fractions that are the same as one whole. This helps introduce students to the concept of equivalent fractions. Students are introduced to a new fraction (twelfths) and build understanding of equivalency by using fraction models to identify fractions that are equivalent to $\frac{1}{2}$. Students share findings and conclusions about equivalent fractions.

LESSON PREPARATION FOR THE TEACHER

- Print out the Twelfths Fraction Model—Student Strips Blackline Master. Cut each document to create five fraction model strips. Each student will need one strip to label, color, and cut apart.
- Print and cut out one copy of the Twelfths Fraction Model—Teacher Strips Blackline Master.

LEARNING OBJECTIVES

Students will:

- Use fraction models to find fractions equivalent to $\frac{1}{2}$.

MATERIALS

- Fractions anchor chart
- Fraction model strips—student sets and teacher set
- Twelfths Fraction Model—Student Strips (one strip per student)
- Twelfths Fraction Model—Teacher Strips
- Scissors
- Crayons or colored pencils
- Mathematics Student Book and pencil

KEY VOCABULARY

- Benchmark fraction
- Equivalent
- Equivalent fraction
- Twelfths
- Review previous fraction vocabulary as needed.

Connect (10 to 15 minutes)

Directions

1. TEACHER DO: Have students take out fraction model strips for one whole, halves, thirds, fourths, sixths, and eighths and show all the ways they can make one whole. Call on volunteers to use your large set of fraction strips to show one way they made a whole. Call on other volunteers to record the fractions on the board. Guide students so that the board eventually looks like this:

$$1 \text{ (one whole)} = \frac{2}{2} = \frac{3}{3} = \frac{4}{4} = \frac{6}{6} = \frac{8}{8}$$

TEACHER SAY: Turn and talk to your Shoulder Partner now about what you notice about the fractions we just wrote on the board together.

STUDENTS DO: Share observations with a **Shoulder Partner**.

TEACHER DO: After about 2 minutes, use **Calling Sticks** to call on students to share ideas. They may notice:

- The numerator and the denominator are the same in each fraction.
- It does not matter what the numerators and denominators are (the whole can be divided into any number of pieces). As long as they are the same, they equal 1.
- The fractions are equal to one whole and to each other.
- The fractions can be written with the equal sign because they all are the same as one whole.

TEACHER SAY: These fractions are EQUIVALENT FRACTIONS. They use different fractional parts, but they are all worth the same amount.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today we are going to explore the benchmark fraction $\frac{1}{2}$. Mathematicians call this a BENCHMARK FRACTION because it helps us anchor our understanding of fractional pieces. Turn and Talk to your Shoulder Partner for 1 minute and share everything you can think of as it relates to one-half.

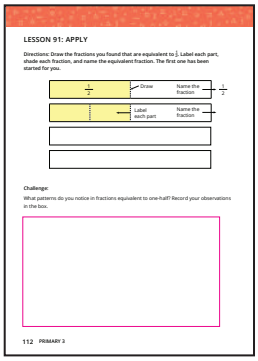
STUDENTS DO: Talk to **Shoulder Partner** about what they know about one-half.

TEACHER DO: Call on a few students to share ideas.

2. TEACHER SAY: You had a lot of great connections to one-half, our benchmark fraction for today's work. We are going to now make one more fraction model. I am going to hand out a new strip to each of you. Once you get your strip, see if you can figure out the name of the fractional parts. Keep it to yourself for now.

TEACHER DO: Distribute the Twelfths Fraction Model strips to students. When finished, call on students to name the fraction until someone names 12ths. Guide students through the process of labeling, coloring, and cutting the fraction strip pieces apart.

STUDENTS DO: Create a set of 12ths fraction strips.


LESSON 91: APPLY

Directions: Draw the fractions you found that are equivalent to $\frac{1}{2}$. Label each part, shade each fraction, and name the equivalent fraction. The first one has been started for you.

$\frac{1}{2}$ Draw Name the fraction $\frac{1}{2}$

Label each part Name the fraction

Challenge:

What patterns do you notice in fractions equivalent to one-half? Record your observations in the box.

112 PRIMARY 3

3. TEACHER SAY: Now, we get to have some fun with all our fractional pieces. First, open your Mathematics Student Book to page Lesson 91: Apply. Once you find the page, hold up the model that represents one-half, our benchmark fraction for today.

STUDENTS DO: Turn to the Apply page, take out models, and hold up the strip that shows $\frac{1}{2}$.

TEACHER SAY: I want you to use your fraction strips to find fractions that are equivalent to $\frac{1}{2}$. Each time you find equivalent fractions, record your answer on the Apply page. If we are adding fractions to equal $\frac{1}{2}$, can I use a $\frac{1}{3}$ piece and a $\frac{1}{4}$ piece? Think for a moment, then raise your hand when you have an idea.

STUDENTS DO: Think about whether or not they can add two fractions with different denominators. Raise hand to volunteer. Selected students share thinking.

TEACHER DO: Confirm accurate thinking and make sure all students understand that they should focus on working with one fractional part at a time to create $\frac{1}{2}$.

Note to the Teacher: Students should remember from the addition and subtraction lessons that they cannot add two fractions with different denominators. Some students may be able to explain that they would not know what to call the resulting sum.

TEACHER SAY: What questions do you have before you begin?

STUDENTS DO: Ask clarifying questions, if needed.

TEACHER DO: Answer questions as needed. Decide whether you want students to work independently or with partners and direct them accordingly. Have students begin working. Encourage students who finish early to try the Challenge problem.

STUDENTS DO: Find combinations of fractional pieces (using models) to make one-half. Record answers on the Apply page. Students who finish early can try the Challenge problem.

TEACHER DO: As students explore, monitor and push their thinking with questions such as:

- What fractional pieces are you using (fourths, eighths, and so on) to create fractions equivalent to $\frac{1}{2}$?
- What did you notice about how many _____ (for example, fourths) it takes to make $\frac{1}{2}$?

- Are you able to find fractions equivalent to $\frac{1}{2}$ with all of your fractional pieces? If not, which one(s) will not work?

When Learn time is over, use an **Attention Getting Signal**.

Reflect (5 to 10 minutes)

Directions

1. TEACHER DO: Call on volunteers to share answers and model work at the board using your fraction strips. Students should write the fractions they create as well. Ask any students who tried the Challenge problem to share answers as well.

STUDENTS DO: Record work and fraction names on the board. If possible, share answers to the Challenge problem.

TEACHER DO: If time allows, engage students in a conversation about equivalent fractions. What do they know about equivalent fractions? Do they notice any patterns between the numerators and denominators of fractions that are equivalent to $\frac{1}{2}$?

TEACHER SAY: You were great math investigators today. We will talk about equivalent fractions again in our next math lesson.

Lesson 92 Overview

LESSON OVERVIEW

In this lesson, students continue to explore equivalent fractions for $\frac{1}{2}$ using picture models and number lines. Moving from concrete models (fraction models) to pictorial models (number lines and pictures) helps move students along a continuum of understanding. To close the lesson, students reflect on themselves as mathematicians and decide which fraction model they prefer to use when finding equivalent fractions—the fraction models, pictures, or number lines.

LEARNING OBJECTIVES

Students will:

- Use drawings and number lines to find equivalent fractions.
- Explain which model they prefer to use to find equivalent fractions.

LESSON PREPARATION FOR THE TEACHER

- No additional preparation needed.

KEY VOCABULARY

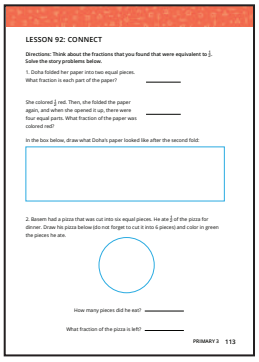
Review fraction vocabulary as needed.

MATERIALS

- Fractions anchor chart
- Chart paper or large white construction paper
- Colored pencils or markers
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 92: CONNECT

Directions: Think about the fractions that you found that were equivalent to $\frac{1}{2}$. Solve the story problems below.

1. Doha folded her paper into two equal pieces. What fraction is each part of the paper? _____

She colored $\frac{1}{2}$ red. Then, she folded the paper again, and when she opened it up, there were four equal parts. What fraction of the paper was colored red? _____

In the box below, draw what Doha's paper looked like after the second fold.

2. Bassem had a pizza that was cut into six equal pieces. He ate $\frac{1}{2}$ of the pizza for dinner. Draw his pizza below (do not forget to cut it into 6 pieces) and color in green the pieces he ate.

How many pieces did he eat? _____

What fraction of the pizza is left? _____

PRIMARY 2 113

1. TEACHER SAY: To launch our math class today, you will apply your understanding of equivalent halves from our last math class. Please open your Mathematics Student Book to page Lesson 92: Connect and work on your own to solve the problems. When you are done, you may discuss your thinking with your Shoulder Partner.

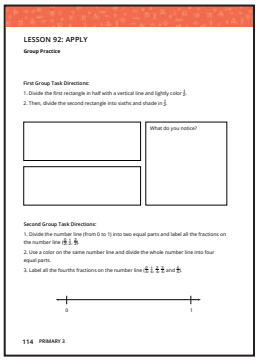
STUDENTS DO: Turn to the Connect page and work independently to solve the problems. When done, discuss answers with a **Shoulder Partner**.

TEACHER DO: Give students about 5 minutes to work on the problems and discuss with **Shoulder Partner**. Walk around to observe work. Then, use **Calling Sticks** to choose students to share answers and thinking for each problem.

Note to the Teacher: For the first problem, some students may write that $\frac{1}{2}$ of the paper was colored red, while others will write $\frac{2}{4}$. For the second problem, some students may write that $\frac{1}{2}$ the pizza is left, while others will write $\frac{3}{6}$. Ask questions to help students build understanding that both answers for each problem are correct. Encourage students to use the term equivalent fractions in conversations.

Learn (35 to 45 minutes)

Directions


LESSON 92: APPLY

Group Practice

First Group Task Directions:

1. Divide the first rectangle in half with a vertical line and lightly color $\frac{1}{2}$.
2. Then, divide the second rectangle into sixths and shade in $\frac{1}{2}$.

What do you notice?

Second Group Task Directions:

1. Divide the number line (from 0 to 1) into two equal parts and label all the fractions on the number line $\frac{0}{2}, \frac{1}{2}, \frac{2}{2}$.
2. Use a color on the same number line and divide the whole number line into four equal parts.
3. Label all the fourths fractions on the number line $\frac{0}{4}, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}$, and $\frac{4}{4}$.

0 1

114 PRIMARY 2

1. TEACHER DO: Display the chart paper or large white construction paper on the board. Draw two long rectangles of the same size on the paper. (See page Lesson 92: Apply for a specific example.)

TEACHER SAY: In our last math class, we used our fraction models to find equivalent fractions for $\frac{1}{2}$. Raise your hand if you remember one fraction that was equivalent to $\frac{1}{2}$.

STUDENTS DO: Raise hand to volunteer. Selected students share examples of fractions that are equivalent to $\frac{1}{2}$.

TEACHER DO: Call on students until $\frac{2}{4}$, $\frac{3}{6}$, $\frac{4}{8}$, and $\frac{6}{12}$ are shared.

2. TEACHER SAY: We are going to continue to explore fractions that are equivalent to $\frac{1}{2}$, but

today we will use pictures and number lines to help us build understanding. Please open your student book to page Lesson 92: Apply and read the directions silently. I will call on one of you to read the directions aloud.

STUDENTS DO: Turn to the Apply page and read the directions. Selected student reads directions for the First Group Task.

TEACHER SAY: Divide the first rectangle in half with a vertical line and lightly color $\frac{1}{2}$.

STUDENTS DO: Divide the rectangle in half and lightly color $\frac{1}{2}$.

TEACHER DO: Draw a rectangle on the board and color $\frac{1}{2}$.

TEACHER SAY: Now, divide the second rectangle into sixths and color in $\frac{1}{2}$ of the rectangle.

STUDENTS DO: Divide the second rectangle into sixths and color $\frac{1}{2}$.

TEACHER SAY: Lean and Whisper how many sixths are colored.

STUDENTS DO: Whisper answers.

TEACHER SAY: What fraction of the whole second rectangle is colored? Whisper into your hand. What do you notice? Record your thinking in the box on the page.

STUDENTS DO: Whisper answers.

Note to the Teacher: Students may answer $\frac{1}{2}$ or $\frac{3}{6}$, both of which are correct. Confirm both as correct.

TEACHER SAY: $\frac{3}{6}$, or $\frac{1}{2}$, of the second rectangle is colored. We can see that $\frac{1}{2}$ and $\frac{3}{6}$ represent the same amount, just as they did when we used our fraction models. We can record this observation using an equal sign.

TEACHER DO: Write $\frac{1}{2} = \frac{3}{6}$ on the board.

TEACHER SAY: Since both fractions take up the same amount of space of equal-sized wholes, they are equivalent. Now let's see what happens on a number line model. In the box below the rectangles there is a number line. Divide the number line into two equal parts and label all the fractions on the number line. Give me a Thumbs Up when finished.

STUDENTS DO: Divide the line to show halves. Label all fractional parts.

TEACHER DO: Draw a number line like the one in the student book on the chart paper at the board. Call on students to share thinking and model how they made the line and labeled the parts.

3. TEACHER SAY: Good work. We divided the whole into two equal parts and labeled $\frac{1}{2}$. You knew that the first mark represented zero, or zero halves. At the other end of the number line you labeled 1. That mark can also be two halves, or $\frac{2}{2}$. Now, take a color and divide the same number line into four equal parts. Give me a Thumbs Up when you are done.

STUDENTS DO: Use a color to divide the number line into four equal parts. Give a **Thumbs Up** when done.

TEACHER DO: Call on a student to come to the front and share work. Then, have students complete step 3.

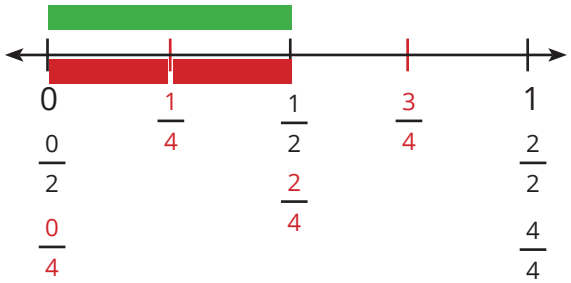
STUDENTS DO: Label colored marks $\frac{0}{4}$, $\frac{1}{4}$, $\frac{1}{4}$, $\frac{3}{4}$, and $\frac{4}{4}$.

TEACHER DO: Call on a student to help label each mark on the number line on the board. Have students correct work as needed.

TEACHER SAY: Now, we can look at this number line and see that $\frac{1}{2}$ lines up exactly where $\frac{2}{4}$ is. Just as with our fraction models, we can see that $\frac{2}{4}$ is equivalent to $\frac{1}{2}$ on the number line. They

both represent the same value.

TEACHER DO: Draw a colored line showing one-half and then use a different color to show $\frac{2}{4}$. See example below.



4. TEACHER SAY: For the rest of Learn you will use different models to find more equivalent fractions for $\frac{1}{2}$. What questions do you have? If you finish early, try the Challenge problems.

STUDENTS DO: Ask questions to clear up any misconceptions. Then, spend the rest of Learn drawing models and finding equivalent fractions for $\frac{1}{2}$ in the student book. Students who finish early may work on the Challenge problems.

TEACHER DO: Walk around the room, observing students as they work and helping those who might need extra support. Check to see that students are dividing number lines into equal parts and drawing accurate models. Some of the models are of fractions that they did not make with the kits (such as tenths), but worked with in the last chapter with proper fractions.

TEACHER SAY: You did great work today using different models to find fractions equivalent to $\frac{1}{2}$. Keep out your student book for Reflect.

Reflect (5 to 10 minutes)

Directions


LESSON 92: MATH JOURNAL

Directions: Reflect on the work you did in the last two lessons to find fractions equivalent to $\frac{1}{2}$. Which model did you prefer? Do you like to use fraction strips, picture models, or number lines? Record your preference and explain why in the box below. You may use words, numbers, and pictures to show your thinking.

PRIMARY 2 117

1. TEACHER DO: Have students turn to page Lesson 92: Math Journal and read the journal prompt to themselves. Make sure students understand the directions. Be sure to collect students' books to read journal responses. They will provide valuable information about students' current understanding of equivalent fractions.

STUDENTS DO: Respond to the journal prompt.

Lesson 93 Overview

LESSON OVERVIEW

Students begin this lesson by identifying fractions equivalent to $\frac{1}{2}$ and explaining why some fractions are not equivalent to $\frac{1}{2}$. Encourage students to use fraction vocabulary terms, as this is an important mathematical practice. In Learn, students use fraction model strips to find equivalent fractions for proper fractions other than $\frac{1}{2}$. They close the lesson by participating in a **Gallery Walk** and discussing other equivalent fraction pairs they found during independent practice.

LEARNING OBJECTIVES

Students will:

- Use concrete models to identify equivalent fractions other than $\frac{1}{2}$.

LESSON PREPARATION FOR THE TEACHER

- No additional preparation needed.

KEY VOCABULARY

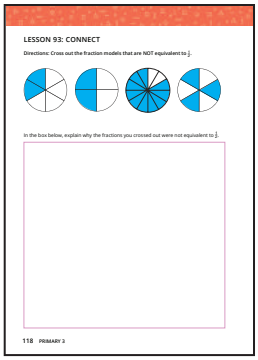
Review previous fraction vocabulary as needed.

MATERIALS

- Fractions anchor chart
- Fraction model strips—student sets and teacher set
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 93: CONNECT

Directions: Cross out the fraction models that are NOT equivalent to $\frac{1}{2}$.

In the box below, explain why the fractions you crossed out were not equivalent to $\frac{1}{2}$.

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1. TEACHER DO: Have students open Mathematics Student Books to page Lesson 93: Connect. Make sure students understand the directions and have them begin working independently. Direct students to give you a **Thumbs Up** when they are finished. As students are working, draw on the board the fraction circles that are on the Connect page. When students are finished, call on students to share work on the board. Engage all students in a discussion to share thinking about why the fractions they crossed out are not equivalent to $\frac{1}{2}$.

Note to the Teacher: Students' answers may include:

- *Comparing fractions: The first fraction ($\frac{2}{6}$) is less than $\frac{1}{2}$ because $\frac{3}{6}$ is one half.*
- *Visual comparison: The third fraction ($\frac{10}{12}$) is almost a whole circle, so it is more than $\frac{1}{2}$.*
- *Visualization: If I folded the circle into two equal pieces, that would be $\frac{1}{2}$ and the first fraction and the third fraction would not cover exactly half of the circle (or one of the equal pieces).*

TEACHER DO: Ask students to state the value of each fraction. Record them on the board below the circles. Also, record students' comparison answers on the board (for example, $\frac{2}{6} < \frac{1}{2}$ on the board and $\frac{10}{12} > \frac{1}{2}$). This reinforces the idea of $\frac{1}{2}$ being a benchmark that can help students when thinking of relative size.

TEACHER SAY: I heard you using a lot of good strategies for comparing fractions and thinking about why some fractions are not equivalent to $\frac{1}{2}$. $\frac{1}{2}$ is an important benchmark fraction and helps us think about the size of other fractions. Today we are going to find some more equivalent fractions.

Learn (35 to 45 minutes)

Directions

1. TEACHER DO: Have students take out fraction model strips.

TEACHER SAY: A few lessons ago, we used our fraction models to draw equivalent fractions. Today we are going to do the same thing but for a fraction other than $\frac{1}{2}$. Take out one $\frac{1}{4}$ fraction model from your kit and lay it down on your table. Then, use your other models to find fractions that are equivalent to $\frac{1}{4}$. Give me a Thumbs Up when you are done.

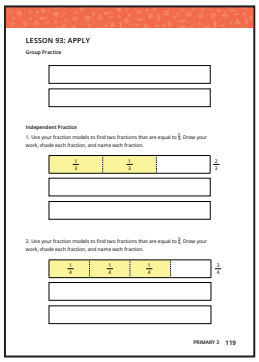
STUDENTS DO: Use fraction models to find fractions that are equivalent to $\frac{1}{4}$. Give a **Thumbs Up** when ready to share.

TEACHER DO: After about 2 minutes, call on students to share findings. Have students use your large fraction models to show work at the board. Encourage them to share strategies for finding equivalent fractions.

2. TEACHER SAY: I am going to give you some time to explore other equivalent fractions. Spend the next few minutes using your fraction models to find other equivalent fractions. You can choose any fraction you like. For example, I might explore equivalent fractions for $\frac{3}{4}$. After a few minutes, I am going to ask you to share your findings with your Shoulder Partner. Until then, work on your own.

STUDENTS DO: Work independently to find other examples of equivalent fractions using fraction models.

TEACHER DO: Give students about 5 minutes to explore and then have them share work with a **Shoulder Partner**. After about 3 minutes, call on students to share findings with the class, using your large fraction models to show work at the board.


LESSON 93: APPLY

Group Practice

Independent Practice

1. Use your fraction models to find two fractions that are equal to $\frac{1}{2}$. Draw your work, shade each fraction, and name each fraction.

2. Use your fraction models to find two fractions that are equal to $\frac{1}{3}$. Draw your work, shade each fraction, and name each fraction.

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3. TEACHER SAY: Turn to page Lesson 93: Apply in your book. In the section labeled Group Practice, draw two of the equivalent fractions you found. Label the fraction pieces and name the equivalent fractions.

STUDENTS DO: Draw lines to show two equivalent fractions they found. Label the fraction pieces and name the equivalent fractions.

TEACHER DO: Walk around and monitor students' work. If they are struggling with the activity, stop them and work through an example together. When students are ready to move on, go over the directions for the Independent Practice section.

4. TEACHER SAY: Use your fraction models to find and record more equivalent fractions. The first two problems tell you the first fraction. You will look for equivalent fractions for $\frac{2}{3}$ and $\frac{3}{4}$. Then, you get some time to continue exploring with your strips and record other equivalent fractions. Record the fractions you find in the rectangles. We will share the equivalent fractions at the end of class. If you finish early, you may try the Challenge problem. Are there any questions?

STUDENTS DO: Ask questions as needed and then work on finding and recording equivalent fractions using fraction models for the rest of Learn. Students who finish early can work on the Challenge problem.

TEACHER DO: Answer questions and clear up any misconceptions. Then, walk around the class, observing students as they work. If any students are struggling, bring them into a smaller group to work together. **Model** how to lay out a fraction and then look for other fraction parts that "match" to find equivalence. **Model** how to record answers. At the end of Learn time, use an **Attention Getting Signal**.

TEACHER SAY: I saw a lot of hard work happening today. Please put your fraction models away but leave your student book out and open to the Apply section.

Reflect (5 to 10 minutes)

Directions

1. TEACHER DO: Conduct a **Gallery Walk** for 2 to 3 minutes so students can see the equivalent fractions that were found. Ask students to keep in mind at least one set of equivalent fractions they see. Direct students to stop and freeze when you clap twice.

STUDENTS DO: Walk around the room looking at other students' work and reflecting on their own equivalent fraction pairs. Stop when two claps are heard. Selected students share equivalent fractions they observed during the **Gallery Walk** (or equivalent fractions they wrote on their own Apply page).

TEACHER DO: Record students' equivalent fractions on the board for the next lesson.

TEACHER SAY: **We found so many new equivalent fractions today. I will keep this list on the board for a game we will play in our next math lesson.**

Lesson 94 Overview

LESSON OVERVIEW

To begin this lesson, students analyze a problem to identify errors related to quadrilaterals and shape attributes. Circling back to previous topics is a helpful way to keep content fresh in students' minds. In Learn, students continue to build facility with equivalent fractions by matching equivalent fractions. Some students may still need concrete models, but encourage those who are ready for a challenge to work without them. Since they are working with partners, they may be able to help each other build deeper understanding of equivalence. Students end the lesson by collaborating to answer the Essential Question: What is an equivalent fraction? They record the class definition in student books and include examples.

LEARNING OBJECTIVES

Students will:

- Analyze errors to identify quadrilaterals.
- Match equivalent fractions.
- Explain why two fractions are or are not equivalent.
- Define the term equivalent.

LESSON PREPARATION FOR THE TEACHER

- Make sure the list of equivalent fractions from Lesson 93's Reflect is written on the board.
- Print the Fraction Matching Cards Blackline Master to create one set of cards for each pair of students. See Chapter Preparation for Lesson 94 for details.

KEY VOCABULARY

Review quadrilateral and fraction vocabulary as needed.

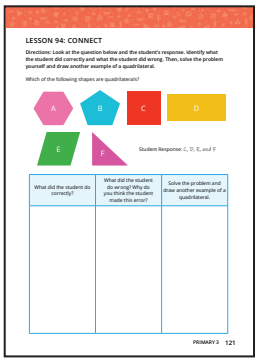
MATERIALS

- Fractions anchor chart
- Fraction model strips—student sets and teacher set
- Fraction Matching Cards sets (one set per pair of students)
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions

1. TEACHER SAY: Today we are going to begin with a review of something other than fractions. It helps to keep our math brains healthy when we review skills and concepts we have already learned.


LESSON 94: CONNECT

Directions: Look at the question below and the student's response. Identify what the student did correctly and what the student did wrong. Then, solve the problem yourself and draw another example of a quadrilateral.

Which of the following shapes are quadrilaterals?

A B C D E F

Student Response: C, D, E, and F

What did the student do correctly?	What did the student do wrong? Why do you think the student made this error?	Solve the problem and draw another example of a quadrilateral.

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TEACHER DO: Have students open Mathematics Student Books to page Lesson 94: Connect and complete the warm-up activity independently. Give students 3 to 5 minutes to work on the problem and discuss with **Shoulder Partner**. Then, use **Calling Sticks** to choose one or two students to share what the error was as well as what was done correctly.

Note to the Teacher: Students should recognize that the student in the Connect problem correctly identified the square, rectangle, and parallelogram as quadrilaterals, but included the triangle, which is not a quadrilateral because it does not have four sides. Attributes of shapes were introduced earlier in the year, so this should be a review, but if students seem to struggle recalling the names of the shapes and identifying attributes of each, spend a few minutes reviewing the concept and possibly reviewing the names of other two-dimensional shapes.

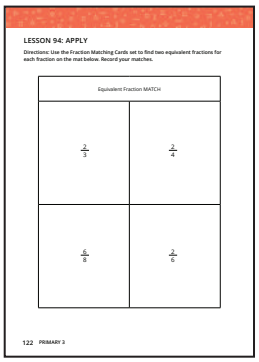
Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today our learning goal is to answer an Essential Question about fractions. The question is: What is an equivalent fraction? We have been talking a lot about equivalent fractions. We have found equivalent fractions for $\frac{1}{2}$, and in our last class, we found fractions that were equivalent to other proper fractions. Let's look at the list of equivalent fractions we made in our last math lesson. Raise your hand if you would like to share a pair of equivalent fractions you discovered and show us how you know that the two are equivalent.

TEACHER DO: Select three or four students to share and model equivalent fractions they found in the last math lesson (or other fractions that are listed on the board). They can use your large fraction model strips or draw models on the board.

STUDENTS DO: Raise hand to volunteer. Selected students name equivalent fractions and model them at the board. Students may ask a friend for help if necessary.


LESSON 94: APPLY

Directions: Use the Fraction Matching Cards set to find two equivalent fractions for each fraction on the mat below. Record your matches.

Equivalent Fraction MATCH

$\frac{2}{3}$ $\frac{3}{4}$

$\frac{6}{8}$ $\frac{2}{6}$

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2. TEACHER SAY: Good work. Today we are going to continue to explore equivalent fractions by doing a matching activity. Please open to page Lesson 94: Apply and read the directions silently. Then, take out your fraction model strips.

STUDENTS DO: Open student book to Apply page and read the directions. Take out fraction model strips.

TEACHER SAY: On this page is a matching mat. You will work with a partner. You and your partner will get a set of matching cards.

TEACHER DO: Hold up a set of matching cards.

TEACHER SAY: You will find fractions in the deck of cards that are equivalent to the ones listed on the mat. You only need one mat for the activity, but both of you will record what you find in your own student book. When you start working with your partner, you may find it helpful to lay out the fractions listed on the mat. You may have a few cards that do not fit anywhere. We will stop a few minutes before Reflect to share our findings. If you finish before then, you and your partner may try the Challenge problem. Let's use Hands Up Pair Up to find partners.

STUDENTS DO: Find a partner using **Hands Up Pair Up** and get a deck of cards. Spend the rest of the Learn time matching the cards to equivalent fractions on the mat using fraction models as needed to test each card. Partners who finish early can work on the Challenge problem together.

TEACHER DO: Walk around the room, observing students as they collaborate. Make note of students who seem to struggle finding equivalent fractions and offer help as needed. When there are 5 minutes left in Learn, use an **Attention Getting Signal**. Have students return card sets to you and return to seats.

TEACHER SAY: Let's share some of the fractions that you found were equivalent to the fractions on the mat. Give me a Thumbs Up to share.

STUDENTS DO: Give a **Thumbs Up** to volunteer. Selected students share an equivalent fraction match.

TEACHER DO: Call on at least two students to share an equivalent fraction for each fraction listed on the mat. Record on the board. Then, call on one or two students to discuss fraction cards that did not go on the mat. Ask if anyone might know of an equivalent fraction for these. (This is the Challenge question, so students may or may not get to it, but it is good to think about which fractions are not equivalent as well as ones that are.)

TEACHER SAY: You did wonderful work today finding more equivalent fractions. Keep out your student book for Reflect.

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: Our goal today was to be able to answer an Essential Question: What is an equivalent fraction? Turn to your Shoulder Partner and talk about a definition for equivalent fraction.

STUDENTS DO: Talk to partner about a definition for equivalent fraction.

TEACHER DO: After 1 to 2 minutes, work with the whole group to create a definition that can be recorded on the Fractions anchor chart and copied in student's Math Vocabulary section. Example: Equivalent fractions are fractions with different numerators and denominators, but have the same value (or take up the same amount of the whole).

Write the definition on the Fractions anchor chart and have students record it in the Math Vocabulary section of the student book. Ask students to provide an example of equivalent fractions. Record one or two examples with the class definition (students should record it too).

STUDENTS DO: Record the class definition and some examples in the vocabulary section of the student book.

Lesson 95 Overview

LESSON OVERVIEW

In this lesson, students review estimation in Connect. They are reminded that estimation is a helpful tool in determining whether or not their answers are reasonable. In Learn, students enrich understanding of fractions as numbers by looking for patterns and relationships between numerators and denominators in equivalent fractions. Through a class discussion, they begin to consider the role of addition and multiplication in finding equivalent fractions. For Reflect, they consider whether or not the patterns and relationships they identified always exist between equivalent fractions. This question pushes students to think beyond the few fractions they have learned and to test current understanding of equivalent fractions.

LEARNING OBJECTIVES

Students will:

- Find equivalent fractions.
- Describe patterns and relationships between numerators and denominators in equivalent fractions.

LESSON PREPARATION FOR THE TEACHER

- No additional preparation needed.

KEY VOCABULARY

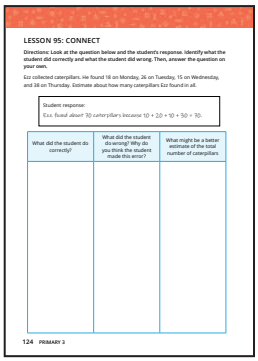
- Denominator
- Estimation
- Numerator
- Numeric pattern

MATERIALS

- Fractions anchor chart
- Fraction model strips—student sets and teacher set
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 95: CONNECT

Directions: Look at the question below and the student's response. Identify what the student did correctly and what the student did wrong. Then, answer the question on your own.

Ezz collected caterpillars. He found 18 on Monday, 26 on Tuesday, 15 on Wednesday, and 38 on Thursday. Estimate about how many caterpillars Ezz found in all.

Student response:
Ezz found about 70 caterpillars because 10 + 20 + 10 + 30 = 70.

What did the student do correctly?	What did the student do wrong? Why do you think the student made this error?	What might be a better estimate of the total number of caterpillars

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1. TEACHER SAY: In our last math lesson, we talked about how important it is for us to review things we have previously learned. It helps us check our understanding and confirm our learning. For Connect today, we are going to review estimation. Please open your Mathematics Student Book to page Lesson 95: Connect and read the directions to yourself.

TEACHER DO: Check to make sure students understand the directions and then have them begin working independently to conduct the error analysis. When they are done, they should discuss thinking with a **Shoulder Partner**.

After about 5 minutes, use **Calling Sticks** to select students to share answers and explain thinking. Ask students to share the strategies they used to come up with an estimate. If time permits, ask students to find the actual total of the four numbers to check estimates.

TEACHER SAY: Nice job. Estimation is a great skill to help guide us when solving problems, so it is good to review often. It is a strategy that helps us know whether or not our answers are reasonable.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today our learning goal is to identify patterns and relationships in equivalent fractions and to use these patterns and relationships to help us better understand equivalence. First, review with your Shoulder Partner what the words "numerator" and "denominator" mean.

STUDENTS DO: Discuss the meaning of numerator and denominator with a partner.

TEACHER DO: Call on students to share definitions and clear up any misconceptions, ensuring that students are clear that the numerator represents the part of the whole and the denominator represents all the parts that make up the whole.

2. TEACHER SAY: Let's see if we can identify any patterns or number relationships between numerators and denominators in equivalent fractions. We will start with our benchmark fraction, $\frac{1}{2}$. Think about your fraction model strips. Give me a Thumbs Up if you can remind us of one of the equivalent fractions we discovered for $\frac{1}{2}$.

TEACHER DO: Call on enough students so that $\frac{2}{4}$, $\frac{3}{6}$, and $\frac{4}{8}$ are shared (if students mention $\frac{5}{10}$ or $\frac{6}{12}$, accept those answers). Record the equivalent fractions on the board in order as shown below.

$\frac{1}{2} = \frac{2}{4}$

$\frac{1}{2} = \frac{3}{6}$

$\frac{1}{2} = \frac{4}{8}$

$(\frac{1}{2} = \frac{5}{10}$

$\frac{1}{2} = \frac{6}{12})$

TEACHER SAY: Talk to your Shoulder Partner about the patterns and relationships you notice between the numerators and denominators of these equivalent fractions.

STUDENTS DO: Share observations with a **Shoulder Partner**.

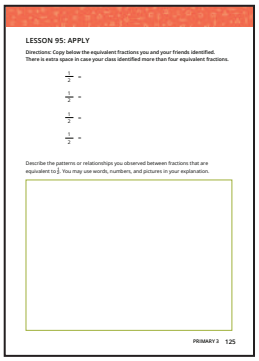
TEACHER DO: After a few minutes, use **Calling Sticks** to select students to share observations. If students are unable to identify patterns, ask questions such as:

- What is the relationship between the numerator and denominator?
- Each time we wrote a new equivalent fraction, how did the numerator change?
- Each time we wrote a new equivalent fraction, how did the denominator change?
- What patterns do you see if you look across from $\frac{1}{2}$ to one of its equivalent fractions?
- What patterns do you see if you look down the list of equivalent fractions?
- Do you see patterns that involve addition? What are they?
- Do you see patterns that involve multiplication? What are they?

Note to the Teacher: The goal of this exercise is to get students to recognize (at a minimum) the following:

- *With fractions that are equivalent to $\frac{1}{2}$,*
- *The denominator is twice (or two times or double) the numerator.*
- *The numerator is half of the denominator.*
- *In the order written on the board, the numerator increases by one in each subsequent fraction and the denominator increases by two.*
  - *If students list $\frac{6}{12}$ but not $\frac{5}{10}$, ask them if they can identify the missing fraction given the patterns they have identified so far.*

3. TEACHER SAY: Let's see if these same patterns exist when we work with other unit fractions. Raise your hand if you can remind us what a unit fraction is.


LESSON 95: APPLY

Directions: Copy below the equivalent fractions you and your friends identified. There is extra space in case your class identified more than four equivalent fractions.

$\frac{1}{2}$ =

$\frac{1}{2}$ =

$\frac{1}{2}$ =

$\frac{1}{2}$ =

Describe the patterns or relationships you observed between fractions that are equivalent to $\frac{1}{2}$. You may use words, numbers, and pictures in your explanation.

PRIMARY 2 125

STUDENTS DO: Raise hand to volunteer. Selected students define unit fraction.

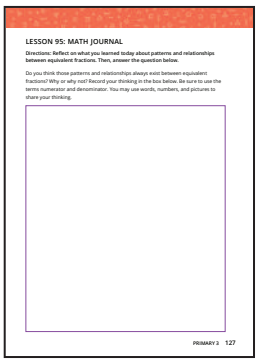
TEACHER DO: Have students turn to page Lesson 95: Apply and read the directions silently. Make sure students understand the directions for both sections. Then, direct students to work with a **Shoulder Partner** to complete the learning activity.

STUDENTS DO: Work with a partner to identify equivalent fractions and explain the patterns and relationships they observe between numerators and denominators.

TEACHER DO: As students work, ask questions similar to the questions asked of the group earlier in the lesson to monitor and probe student thinking. When there are at least 5 minutes left in Learn, use an **Attention Getting Signal**. Ask students to come to the board to record work and explain findings. Encourage students to use the terms numerator and denominator in explanations. Be sure to check students' work prior to the next lesson to determine who may need additional support and practice.

Reflect (5 to 10 minutes)

Directions


LESSON 95: MATH JOURNAL

Directions: Reflect on what you learned today about patterns and relationships between equivalent fractions. Then, answer the question below.

Do you think those patterns and relationships always exist between equivalent fractions? Why or why not? Record your thinking in the box below. Be sure to use the terms numerator and denominator. You may use words, numbers, and pictures to share your thinking.

PRIMARY 2 127

1. TEACHER DO: Have students turn to page Lesson 95: Math Journal. Read the journal prompt aloud to students to ensure they understand what they are being asked to write about. Direct students to begin writing. As they work, walk around to check understanding. Be sure to collect student books to read what students understand and can articulate about using addition and multiplication to find equivalent fractions.

TEACHER SAY: **Give yourself a pat on the back for a job well done today.**

Lesson 96 Overview

LESSON OVERVIEW

Students begin this lesson by applying understanding of equivalent fractions to solve a story problem. By explaining thinking in writing, students confirm and express mathematical understanding in words, pictures, and numbers and confront misunderstandings. Students continue to move along the continuum from concrete models of fractions to abstract representations as they identify fractions on a number line and generate equivalent fractions on a different number line. This learning activity requires them to decide how to break apart the number line in order to find an equivalent fraction. This is a good opportunity to discover who can do this type of thinking independently (and may be ready for more challenging practice) and who needs ongoing support.

LEARNING OBJECTIVES

Students will:

- Solve story problems involving fraction concepts.
- Use a number line to generate and show equivalent fractions.

LESSON PREPARATION FOR THE TEACHER

- No additional preparation needed.

KEY VOCABULARY

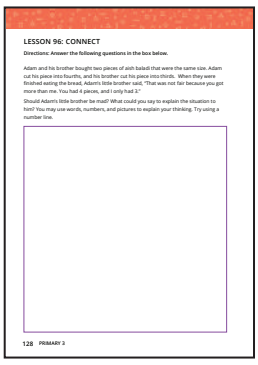
- Equivalent fraction

MATERIALS

- Fractions anchor chart
- Fraction model strips—student sets and teacher set
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 96: CONNECT

Directions: Answer the following questions in the box below.

Adam and his brother bought two pieces of aish baladi that were the same size. Adam cut his piece into fourths, and his brother cut his piece into thirds. When they were finished eating the bread, Adam's little brother said, "That was not fair because you got more than me. You had 4 pieces, and I only had 3."

Should Adam's little brother be mad? What could you say to explain the situation to him? You may use words, numbers, and pictures to explain your thinking. Try using a number line.

128 PRIMARY 3

1. TEACHER DO: Have students open Mathematics Student Books to page Lesson 96: Connect and read the story problem to themselves. Give students 1 or 2 minutes to share thinking with a **Shoulder Partner** and then have them begin working independently to solve the problem. After 4 or 5 minutes, call on students to share explanations with the class.

Note to the Teacher: Encourage students to think of the problem in terms of equivalence. Adam's little brother was concerned about them having equal amounts of bread. Students should understand that since the size of the wholes are equal, $\frac{4}{4}$ and $\frac{3}{3}$ are equivalent fractions. If students understand this quickly, ask them to explain a situation when the younger brother would be correct. What would need to change about the aish baladi for his statement to be true?

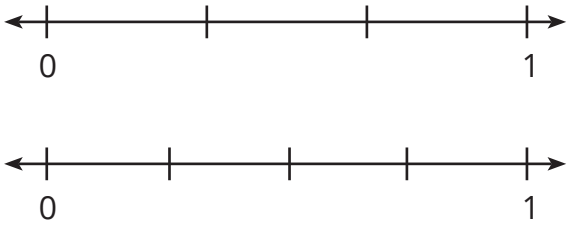
STUDENTS DO: Share thinking with a partner and then work independently to solve the Connect problem. Selected students share explanations with the class using fraction terms.

Learn (35 to 45 minutes)

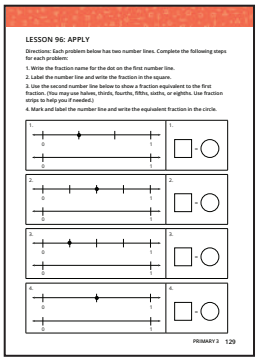
Directions

1. TEACHER SAY: Today our learning goal is to use a number line to generate equivalent fractions.

TEACHER DO: If no student used a number line to explain thinking in Connect, help them make the connection now. Draw two number lines on the board as shown below. Call on students to represent Adam's bread on one and his little brother's bread on the other. Have students label the fractions on their numbers lines, including $\frac{3}{3}$ and $\frac{4}{4}$.



TEACHER SAY: This number line helps us prove that Adam and his little brother had the same amount of bread. It also helps us show the equivalent fractions $\frac{3}{3}$ and $\frac{4}{4}$.


LESSON 96: APPLY

Directions: Each problem below has two number lines. Complete the following steps for each problem:

1. Write the fraction name for the dot on the first number line.
2. Label the number line and write the fraction in the square.
3. Use the second number line below to show a fraction equivalent to the first fraction. (You may use halves, thirds, fourths, fifths, sixths, or eighths. Use fraction strips to help you if needed.)
4. Mark and label the number line and write the equivalent fraction in the circle.

PRIMARY 2 129

2. TEACHER DO: Have students open student books to Lesson 96: Apply and read the directions silently. If you think students are ready to try the first problem independently, have them do so and then go over answers together before allowing them to complete the learning activity independently. If students need more support before working independently, work through the first problem with them. Have volunteers show work and explain thinking at the board. Depending on your students' comfort with the learning activity, you may choose to continue to work on the problems together, have them solve them one at a time and go over the answers together, or allow them to work on the remaining problems independently.

Near the end of Learn, use an **Attention Getting Signal**. Be sure that you leave time to go over the answers together (if you have not already done so).

STUDENTS DO: Work as directed to find equivalent fractions on a number line. Selected students share answers, show work, and explain thinking.

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: Today you worked on generating your own equivalent fractions with a number line. Please think for a moment about a strategy you used to help you today. Give me a Thumbs Up when you have an idea.

STUDENTS DO: Give a **Thumbs Up** to volunteer. Selected students share strategies with the class.

TEACHER SAY: You have moved from just learning about fractions, to using models that you hold in your hand, to drawing pictures, to using number lines. You have really used your great minds to learn a lot about fractions. Well done.

Lesson 97 Overview

LESSON OVERVIEW

Students begin this lesson by solving a problem that challenges them to combine understanding of volume and equivalence. They debate whether or not the shape of a container changes the volume when two containers are filled with the same amount of liquid. They then work to solve real-world story problems involving equivalent fractions. Finally, they reflect on when and why equivalent fractions matter in the real world.

LEARNING OBJECTIVES

Students will:

- Analyze errors to build understanding of volume.
- Apply understanding of equivalent fractions to solve story problems.
- Describe real-life applications of fractions and equivalent fractions.

LESSON PREPARATION FOR THE TEACHER

No additional preparation needed.

KEY VOCABULARY

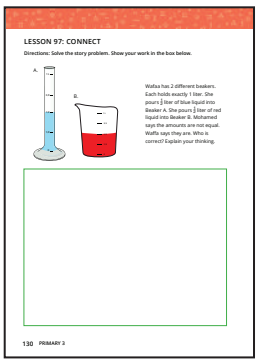
Review volume and fraction vocabulary as needed.

MATERIALS

- Fractions anchor chart
- Fraction model strips—student sets and teacher set
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 97: CONNECT

Directions: Solve the story problem. Show your work in the box below.

Waliba has 2 different beakers. Each holds exactly 1 liter. She pours $\frac{1}{2}$ liter of blue liquid into Beaker A. She pours $\frac{1}{2}$ liter of red liquid into Beaker B. Mohamed says the amounts are not equal. Waliffa says they are. Who is correct? Explain your thinking.

130 PRIMARY 2

1. TEACHER DO: Have students turn to page Lesson 97: Connect in Mathematics Student Books and read the story problem silently. Make sure students understand the directions and have them solve the problem.

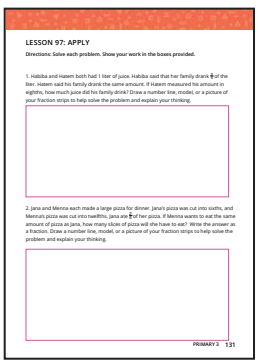
STUDENTS DO: Turn to the Connect page and work independently to solve the problem.

TEACHER DO: After 5 to 7 minutes, go over the work as a class, asking students to explain thinking while recording it on the board. Additional questions that can be asked about this problem include:

- How is this Connect problem similar to the Connect problem in our last class? How is it different?
- Does the shape of a 1-liter beaker change how much liquid it can hold?
- Can you think of an equivalent fraction for $\frac{1}{2}$ that could be poured into the beaker?

Learn (35 to 45 minutes)

Directions


LESSON 97: APPLY

Directions: Solve each problem. Show your work in the boxes provided.

1. Habiba and Hasem both had 1 liter of juice. Habiba said that her family drank $\frac{4}{8}$ of the liter. Hasem said his family drank the same amount. If Hasem measured his amount in eighths, how much juice did his family drink? Draw a number line, model, or a picture of your fraction strips to help solve the problem and explain your thinking.

2. Jana and Menna each made a large pizza for dinner. Jana's pizza was cut into sixths, and Menna's pizza was cut into twelfths. Jana ate $\frac{2}{6}$ of her pizza. If Menna wants to eat the same amount of pizza as Jana, how many slices of pizza will she have to eat? Write the answer as a fraction. Draw a number line, model, or a picture of your fraction strips to help solve the problem and explain your thinking.

PRIMARY 2 131

1. TEACHER SAY: Today our learning goal is to solve story problems with equivalent fractions. You can use number lines, your fractions strips, or picture models to help you. Please open your student book to page Lesson 97: Apply and read the first problem.

STUDENTS DO: Open student books to the Apply page and read the first problem silently.

TEACHER DO: If necessary, ask a volunteer to read the problem to the class.

TEACHER SAY: Turn and Talk to your Shoulder Partner about how to solve this problem.

STUDENTS DO: Share problem-solving strategies with partners.

2. TEACHER DO: Call on students to share what strategy they will use. If students are struggling, solve the first problem together as a class. Based on the ability of the students, this Apply can be done independently or with partners.

STUDENTS DO: Work independently or with a partner to complete the learning activity.

TEACHER DO: Near the end of Apply, use an **Attention Getting Signal** to bring the class back together and have students briefly discuss the problem (or problems) they found the most challenging.

TEACHER SAY: **Great job solving real-world problems with equivalent fractions. Please put your student books away and prepare for Reflect.**

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: **We have been talking so much about fractions lately that I have been wondering when we use fractions and equivalent fractions in our daily lives. It is important to understand why equivalent fractions matter, and seeing some of the ways they are used in the real world helps us develop our understanding. I would like you to help me make a list. If you have an idea, please raise your hand. Then, you can Popcorn to someone else who has a hand raised.**

STUDENTS DO: Raise hands to volunteer. Selected students share ideas and **Popcorn** to another student with a raised hand.

TEACHER DO: Record students' answers on the board or on a piece of chart paper. Sample ideas of times people use fractions or equivalent fractions include:

- When cooking
- When gathering or analyzing data
- Sharing things with siblings
- When following directions to get from one place to another

Accept any ideas that students can explain. Students may only grasp that fractions or equivalent fractions are used for sharing at this point. This is fine, but ask them to go deeper and give scenarios as examples.

TEACHER SAY: **Great job today thinking about how fractions and equivalent fractions are used in the real world. Keep track of other uses you see when you are out of school and let us know what you have discovered.**

Lesson 98 Overview

LESSON OVERVIEW

In this lesson, students begin by reviewing how to find the area and perimeter of rectangles. In Learn, students review how to solve division problems. They build upon prior work with part-part-whole models and incorporate bar models into practice. They expand thinking about what it means to divide in order to write an original story problem based on a given bar model. Finally, students are challenged to consider the relationship between fractions and division. It is not anticipated that students have deep insight into the connections at this point, but it is a powerful learning opportunity to push their thinking in an unexpected direction.

LEARNING OBJECTIVES

Students will:

- Calculate the area and perimeter of rectangles.
- Solve division story problems.
- Discuss the relationship between fractions and division.

LESSON PREPARATION FOR THE TEACHER

- No additional preparation needed.

KEY VOCABULARY

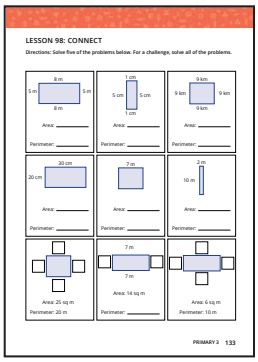
- Quotient

MATERIALS

- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 98: CONNECT

Directions: Solve five of the problems below. For a challenge, solve all of the problems.

PRIMARY 2 133

1. TEACHER SAY: We have been reviewing a lot of important math concepts during Connect. Review is an important part of math as it helps us remember and use what we have learned. Today let's review perimeter and area of rectangles. Please open your Mathematics Student Book to page Lesson 98: Connect.

TEACHER DO: Ask for volunteers who can remind the class of the difference between area and perimeter and how to find each. Then, have students begin working independently to select and solve at least five of the Connect problems.

After 8 to 10 minutes, use an **Attention Getting Signal** to bring the class back together. Have students trade student books with a **Shoulder Partner**. Go over the answers and have the student partners check each other's work.

Note to the Teacher: Since this is a review, allow students to correct errors and do not penalize them for mistakes. Instead, if time allows, ask some students to share an error analysis (what they did wrong and how they corrected it).

TEACHER SAY: Great job. Please keep your student books out for Learn.

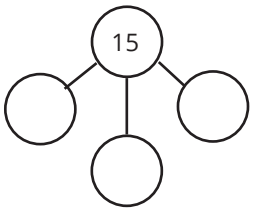
Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Our learning target today is to review and practice solving division problems. Earlier in the year, we worked on two different types of division problems: sharing problems and grouping problems. Raise your hand if you can help us remember the difference.

STUDENTS DO: Raise hand to volunteer. Selected students share ideas about sharing and grouping problems.

TEACHER DO: Remind students that in sharing problems, they are dividing a number evenly into equal groups. For example, consider the problem of sharing 15 cookies among 3 friends. In grouping problems, they worked with part-part-whole models, so have students help you with the model below.



2. TEACHER SAY: Today we are going to learn a new model to help us solve division problems. It is called a bar model. A bar model is similar to our fraction strips. Let's take a part-part-whole model and turn it into a bar model.

The number 15 on the top represents the total number of cookies we have. The bar is split into 3 parts to represent our 3 friends. How is this like our fraction strips? Raise your hand if you have ideas you would like to share.

STUDENTS DO: Raise hand to volunteer. Selected students share ideas.

Note to the Teacher: Students may notice the following:

- *The bar is divided into equal parts.*
- *The bar is the same shape as the fraction strips.*
- *The number 15 is broken into thirds.*

This last concept is difficult and not expected at this stage. However, if students do understand it, it will help to build background knowledge for future fraction work.

TEACHER SAY: We divided 15 into 3 equal parts. I can now write the number 5 in each box of my bar model

TEACHER DO: Add the following to the bar model on the board.

15		
5	5	5

TEACHER SAY: This bar model now shows us that we have one whole number of 15.

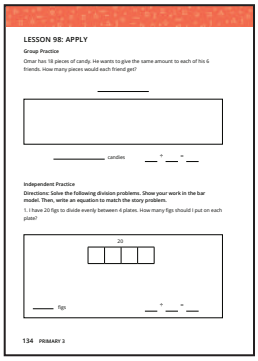
TEACHER DO: Point to the 15.

TEACHER SAY: The 15 is broken into 3 equal parts.

TEACHER DO: Point to the 3 boxes.

TEACHER SAY: Each part has 5. So the answer to our original question is 5 cookies because each person gets 5 cookies.

TEACHER DO: Circle the first box.


LESSON 98: APPLY

Group Practice

Omar has 18 pieces of candy. He wants to give the same amount to each of his 6 friends. How many pieces would each friend get?

_____

_____ candies __ • __ = __

Independent Practice

Directions: Solve the following division problems. Show your work in the bar model. Then, write an equation to match the story problem.

1. I have 20 figs to divide evenly between 4 plates. How many figs should I put on each plate?

20

___ figs __ • __ = __

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TEACHER SAY: I can check my work by making sure my parts add up to 15. Let's count by 5s.

TEACHER DO: Point to each box while counting by 5s.

TEACHER SAY: 5, 10, 15.

STUDENTS DO: Count by 5s along with teacher.

3. TEACHER SAY: Before you begin practicing using bar models to show sharing problems, I would like to show you one more way bar models can help you solve these types of problems. Turn to page Lesson 98: Apply in your student book.

TEACHER DO: Work with students to solve the Group Practice problem. If necessary, guide students through the work to build understanding. However, if they are demonstrating understanding, have them tell you how to solve the problem. Students should recognize that they must divide the bar into 6 equal sections and then determine how many pieces of candy are in each section.

One way to do this is to "hand out" one candy at a time to each friend and represent that as a dot in each section on the bar. Continue to "hand out" candies until all 18 have been distributed. If students suggest other strategies, try them. Ask students to share and show work at the board. Students should record work in the book.

4. TEACHER SAY: We call the answer to a division problem the quotient. Our final step is to write a division equation to match this problem. Work with your Shoulder Partner and see if you can write the division equation that matches this problem.

Note to the Teacher: If students are confused about how to write a division problem that aligns, walk them through the process. For example: What was the total amount? (18), How many friends shared? (6), How many did each friend get? (3). So 18 ÷ 6 = 3.

TEACHER SAY: Do you have any questions about how to write equations to match a story problem?

STUDENTS DO: Raise hands to ask questions if necessary.

5. TEACHER SAY: You will now solve some more division problems with bar models on your own. The last problem on the page is a completed bar model. For that problem, you need to write your own story problem to match what is shown in the bar model. Please begin.

STUDENTS DO: Work independently to solve the Apply problems.

TEACHER DO: Circulate during work time to offer support and assistance as needed. Ask students probing questions such as:

- How did you know the total?
- How did you find the quotient?
- Can you think of another way to solve this problem?

When Learn time is nearly over, use an **Attention Getting Signal** and go over the answers with students.

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: Today we reviewed division. For Reflect, let's think about the relationship between fractions and division. How are they alike? How are they different? I will give you time to think.

STUDENTS DO: Think about the relationship between fractions and division.

TEACHER DO: After a minute or so, have students turn to a **Shoulder Partner** to share thinking. Encourage students to gently and kindly push back on each other's ideas when they disagree, to share examples, to use math vocabulary, and to ask questions.

STUDENTS DO: Share ideas with a partner. Work together to clarify ideas, answer each other's questions, challenge misconceptions, and incorporate math vocabulary in the discussion.

2. TEACHER DO: After 4 to 5 minutes, call on partners to share discussions with the class. Use questioning to correct any serious misconceptions but accept all answers that demonstrate some understanding of the relationship between fractions and division.

Note to the Teacher: Students may note some or all of the following:

- *Both fractions and divisions involve taking something (or a number or a set) and dividing it into smaller pieces.*
- *Both represent parts of a whole.*

Advanced students may recognize that fractions and division are the same and that fractions are an expression of a division problem. In other words, $\frac{1}{2}$ *is the answer to 1 divided by 2,* $\frac{3}{4}$ *is the answer to 3 divided by 4, and* $\frac{2}{3}$ *is the answer to 2 divided by 3. Most (if not all) students will not be ready to recognize these relationships, but they are noted here in case any advanced students do mention them.*

TEACHER SAY: I truly enjoy hearing your mathematical thinking and the way you solve problems together. Good work today.

Lesson 99 Overview

LESSON OVERVIEW

Students begin the lesson solving an error analysis problem involving division. This kind of exercise challenges students to act as the teacher to identify where someone else went wrong and to confront their own misconceptions of division. Students continue their work with scaffolded bar models to review and practice division. The strategy today is similar to repeated subtraction. Students use a bar model again, but this time they know the number in each group but not the total number of groups. In Reflect, students are asked to think about how they use division in their daily lives outside of school. Conversations with students about real-world applications should be encouraged throughout the school day in order for them to understand the greater purpose of their work.

LEARNING OBJECTIVES

Students will:

- Analyze errors to solve a division problem.
- Solve division story problems.
- Write a story problem to fit a given context.
- Describe real-life applications of division.

LESSON PREPARATION FOR THE TEACHER

- No additional preparation needed.

KEY VOCABULARY

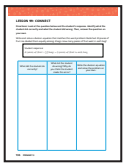
Review previous fraction vocabulary.

MATERIALS

- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

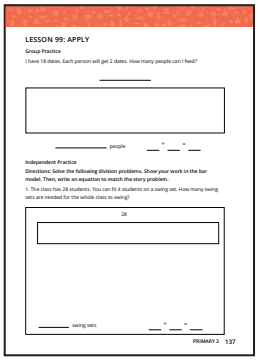
Directions



1. TEACHER DO: Have students open their Mathematics Student Book to page Lesson 99: Connect and read the problem silently. Make sure students understand the directions and then begin working. After about 5 minutes, select students to share their thinking and their explanations. Allow students to show their work on the board as needed and encourage them to use examples and division vocabulary.

Learn (35 to 45 minutes)

Directions


LESSON 99: APPLY

Group Practice

I have 18 dates. Each person will get 2 dates. How many people can I feed?

_____ people

Independent Practice

Directions: Solve the following division problems. Show your work in the bar model. Then, write an equation to match the story problem.

1. The class has 28 students. You can fit 4 students on a swing set. How many swing sets are needed for the whole class to swing?

28

_____ swing sets

PRIMARY 2 137

1. TEACHER SAY: **In our last math lesson, we worked on sharing division problems. Today we are going to solve grouping division problems. We will use bar models to solve the problems, but this time the bar model will tell us how many items we have in each group instead of how many groups. Let's do the first problem together. Please turn in your Mathematics Student Book to page Lesson 99: Apply and read the first problem to yourself.**

STUDENTS DO: Turn to the Apply page in their student book and read the first problem silently.

TEACHER DO: Work with students to solve the Group Practice problem. If necessary, guide students through the work to build understanding. However, if they are demonstrating understanding, have them tell you how to solve the problem. Students should recognize that they can "divide" the bar model by giving the first person 2 dates, drawing a line, giving the second person 2 dates, drawing a line, and so on until they have given away all of the dates. They do not have to be precise in their division of the bar because they do not know how many pieces they are creating.

18

2	2	

2. TEACHER SAY: Now, we can write the equation to go with this problem. Turn and Talk to your Shoulder Partner about the equation that would match this problem.

STUDENTS DO: Talk to their partner.

TEACHER DO: Give students 1 to 2 minutes to talk and then call on students to come to the board and write the equation. Have students explain to each other the reasoning behind the equation.

STUDENTS DO: Record the correct division equation in their student book.

3. TEACHER SAY: Now it is time for you to work on your own to solve some division problems. I will walk around to see how you are doing, so let me know if you have any questions or need some help. At the end of the Apply page, you are asked to write your own story problem using the given bar model. If you finish early and have checked your work, you can try the Challenge problem. Please begin.

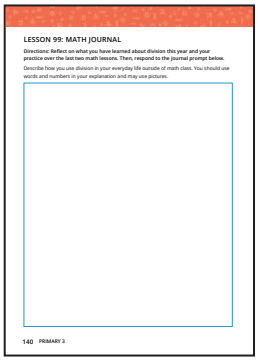
STUDENTS DO: Work independently to solve and write division problems in their student books.

TEACHER DO: Walk around the classroom and monitor for understanding. Identify students who may need additional instruction and practice. Although grouping problems are different than sharing problems, students should still be able to use the bar model to find the answer. If you find that students are using a different model, ask them to explain how they know it works. If their strategy is effective and efficient, allow them to continue.

TEACHER SAY: Please keep your books out for Reflect.

Reflect (5 to 10 minutes)

Directions


LESSON 99: MATH JOURNAL

Directions: Reflect on what you have learned about division this year and your practice over the last two math lessons. Then, respond to the journal prompt below.

Describe how you use division in your everyday life outside of math class. You should use words and numbers in your explanation and may use pictures.

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1. TEACHER DO: Have students turn to page Lesson 99: Math Journal and read the journal prompt. Make sure students understand the directions and have them begin writing and drawing their entries.

STUDENTS DO: Turn to the journal page in their student books and describe their everyday experiences with division.

TEACHER DO: Give students 3 to 5 minutes to write their answers. If time allows, ask a few students to share their writing.

TEACHER SAY: You all accomplished a great deal of challenging work today. Well done.

Lesson 100 Overview

LESSON OVERVIEW

In this lesson, students begin with a challenge to find all the ways 24 cookies can be divided evenly. This activity helps students understand that numbers can often be divided in more than one way. In Learn, students review the relationship between multiplication and division using triangle fact families. They write four equations to represent each family and are challenged to write a multiplication and division story problem about a given set of numbers. To close the lesson, they explain in their own words the relationship between multiplication and division.

LEARNING OBJECTIVES

Students will:

- Investigate different ways to divide 24 evenly.
- Find the missing factor in a fact family.
- Write multiplication and division equations to represent fact families.
- Explain the relationship between multiplication and division.

LESSON PREPARATION FOR THE TEACHER

- No additional preparation needed.

KEY VOCABULARY

Review multiplication and division vocabulary as needed.

MATERIALS

- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions

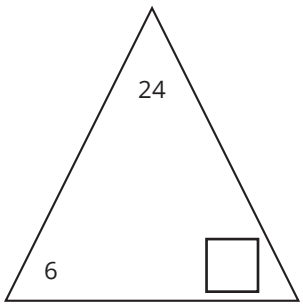
1. TEACHER DO: Have students open their Mathematics Student Book to page Lesson 100: Connect and read the problem silently. Make sure students understand the directions and then begin working. After 5 to 7 minutes, select students to share their answers and explain their thinking. Allow students to show their work on the board as needed and encourage them to use examples and division vocabulary.

TEACHER SAY: Keep out your student book for our lesson today.

Learn (35 to 45 minutes)

Directions

1. TEACHER DO: Draw the triangle below on the board with a 24 at the top, a 6 in the lower left-hand corner, and a blank space in the lower right-hand corner:



TEACHER SAY: Our learning goal for today is to explain the relationship between multiplication and division. We have talked about this relationship a little bit before, but it has been a while, so it is time to refresh our memories. In this case, we are using the word "relationship" like the word "connection." How are multiplication and division connected? Think for a moment, and then give me a Thumbs Up when you have an idea.

STUDENTS DO: Think about the relationship between multiplication and division. Give a **Thumbs Up** to volunteer. Selected students share their ideas with the class.

TEACHER DO: Accept all reasonable answers.

Note to the Teacher: This concept has been discussed in previous chapters, so students should know that multiplication is joining equal groups to create a whole and division is separating a whole into equal groups. These operations are opposite, and division can be used to undo a multiplication problem. If students struggle to describe these relationships, provide examples to support additional discussion.

2. TEACHER SAY: For the first part of today's lesson, you will be solving triangle fact families and writing down all the equations for each family. Then, you will write a multiplication and division story problem for a given family. Look at the fact family I have drawn on the board. Remember, the numbers on the bottom of the triangle are FACTORS. When factors are multiplied together, they make the PRODUCT at the top of the triangle. What is my missing factor in this triangle? Use your fingers to show me your answer.

STUDENTS DO: Hold up fingers to show their answer.

TEACHER SAY: The missing factor is 4. I will now write that equation on the board.

TEACHER DO: Write 6 × 4 = 24.

TEACHER SAY: How else can I write a multiplication equation about this fact family? Raise your hand if you would like to come to the board and show us another way to write this equation.

STUDENTS DO: Raise their hand to volunteer. Selected students write the equation on the board.

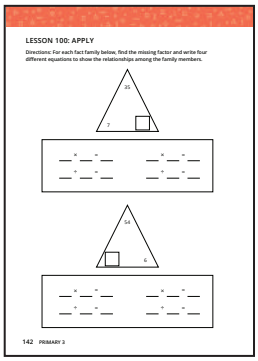
TEACHER SAY: Another way to write the equation is 4 × 6 = 24. Remember, in multiplication, the order of the factors multiplied does not matter. 4 × 6 is the same thing as 6 × 4. This is the Commutative Property of Multiplication that we studied earlier this year.

How can I use my triangle fact family to write a division equation using these same numbers? Turn and Talk to your Shoulder Partner about division equations you could write with the numbers 4, 6, and 24. I will call on some of you to help me write those equations.

STUDENTS DO: Share their thinking with their **Shoulder Partner**. Selected students write division equations on the board. Students may ask a friend for help if necessary.

TEACHER SAY: Wonderful. In the division equation, we take our product from the top of the triangle and divide it by one of its factors. Do you remember what we call the answer to a division problem? Whisper the word aloud.

STUDENTS DO: Whisper their answer.


LESSON 100: APPLY

Directions: For each fact family below, find the missing factor and write four different equations to show the relationships among the family members.

142 PRIMARY 3

3. TEACHER SAY: Now it is your turn to practice solving these kinds of problems on your own. Please open your student book to page Lesson 100: Apply. The first problems are just like the one we did together on the board. The final problem asks you to use the given fact family to write your own multiplication and division story problem with the numbers given. Please begin.

STUDENTS DO: Open their books to the Apply page and work independently to solve fact family problems and record multiplication and division equations for each fact family.

TEACHER DO: Monitor students as they work. Note the strategies they use to find the missing factor. Near the end of Learn, use an **Attention Getting Signal**. Go over the answers with students. If time allows, ask students to explain their thinking and share their strategies.

TEACHER SAY: Please keep your student books out for Reflect.

Reflect (5 to 10 minutes)

Directions

1. TEACHER DO: Have students open their student books to page Lesson 100: Math Journal and read the journal prompt to themselves. Make sure students understand the prompt and then have them begin writing their response. Be sure to collect students' journals to read their responses. Their explanations will provide valuable insight into their understanding of the relationship between multiplication and division.

TEACHER SAY: You all have been working hard on reviewing division and multiplication and showing your understanding of the relationship between them. Give your neighbor a high five to celebrate your learning.

STUDENTS DO: Give their neighbor a high five.

PRIMARY 3

Mathematics

COMMUNICATION

CONNECTIONS

Chapter 5

Lessons 101 to 110

Chapter 5 : Lessons 101 to 110

In this chapter, students review and solidify understanding of multiplication and division and the relationship between the two operations. Students apply and ensure a deep understanding of area and perimeter as well. A key practice of Primary 3 is for students to develop fluency with operations. By the end of the grade, students should be able to quickly and accurately solve a variety of equations using strategies that ease this process for them. When students began learning operations, they used concrete materials to support a conceptual understanding. Now, they should move away from these materials to abstraction for fluency.

COMPONENT	DESCRIPTION	LESSONS
Connect	During this daily routine, students build fluency in previously learned skills, make connections between prior learning and the upcoming Learn segment, and discuss mathematics concepts. Students may be introduced to an engaging, real-world math problem that establishes a purpose for learning a new skill or concept.	10 to 15 minutes
Learn	During this daily routine, students learn and apply various math skills and concepts. Students engage in exploration, experimentation, problem-solving, collaboration, and discussion to build understanding and application of new skills and concepts and make connections to prior learning. Students learn to think and work like mathematicians and persevere in developing foundational understanding of challenging skills and concepts.	35 to 45 minutes
Reflect	During this daily routine, students develop the ability to express mathematical ideas by talking about discoveries, using math vocabulary, asking questions to make sense of learning tasks, clarifying misconceptions, and learning to see things from peers' perspectives.	5 to 10 minutes

Learning Indicators

Throughout Lessons 101 to 110, students will work toward the following learning indicators:

B. OPERATIONS AND ALGEBRAIC THINKING:

1.a. Explain products of whole numbers.
1.b. Explain quotients of whole numbers.
1.c. Multiply and divide within 100.
1.d. Use strategies to solve multiplication and division problems, including:
1) Manipulatives
2) Drawings
3) Arrays
4) The relationship between multiplication and division
1.e. Know from memory all products of two 1-digit numbers by the end of Primary 3.
2.b. Apply the relationship between multiplication and division to solve multiplication and division problems with one unknown.

D. MEASUREMENT AND DATA:

5.a. Identify area as an attribute of plane figures.
5.e. Relate area to the operations of multiplication and repeated addition:
1) Find the area of a rectangle with × square units.
2) Find the area of a rectangle with whole-number side lengths using concrete models.
3) Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real-world and mathematical problems.
5.f. Solve real-world and mathematical problems involving perimeters of polygons, including:
1) Finding the perimeter given the side lengths.
2) Drawing rectangles on a grid with the same perimeter and different areas or with the same area and different perimeters.

CH 5 Pacing Guide

LESSON	INSTRUCTIONAL FOCUS
101	Students will: • Develop fluency in multiplying one-digit numbers. • Identify strategies to help them remember multiplication facts.
102	Students will: • Investigate relationships between numbers in multiplication and division fact families. • Write equations to represent multiplication and division relationships within a fact family. • Explain how they can use the relationship between multiplication and division fact families to master math facts.
103	Students will: • Use a symbol to represent an unknown number in an equation. • Write equations with one unknown number to represent story problems. • Solve equations with one unknown.
104	Students will: • Write story problems that represent given equations. • Apply strategies to solve multiplication story problems.
105	Students will: • Write story problems that represent given equations. • Apply strategies to solve division story problems. • Define division.
106	Students will: • Solve a two-step story problem involving addition and subtraction. • Find the area and perimeter of quadrilaterals. • Find the perimeter of shapes that are not quadrilaterals. • Collaborate to write class definitions for area and perimeter.
107	Students will: • Calculate the area of a shape when given the perimeter. • Determine the missing side lengths of complex shapes when given the perimeter. • Determine the missing side lengths of complex shapes to determine the perimeter. • Decompose complex shapes into smaller quadrilaterals to determine the area.
108	Students will: • Draw hands on clocks to show given times. • Solve story problems involving time. • Determine the perimeter of a rectangle when given the area and one dimension.
109	Students will: • Complete a house design project to demonstrate understanding of area and perimeter.
110	Students will: • Complete a house design project to demonstrate understanding of area and perimeter.

Chapter Preparation for Teacher

For Lesson 101:

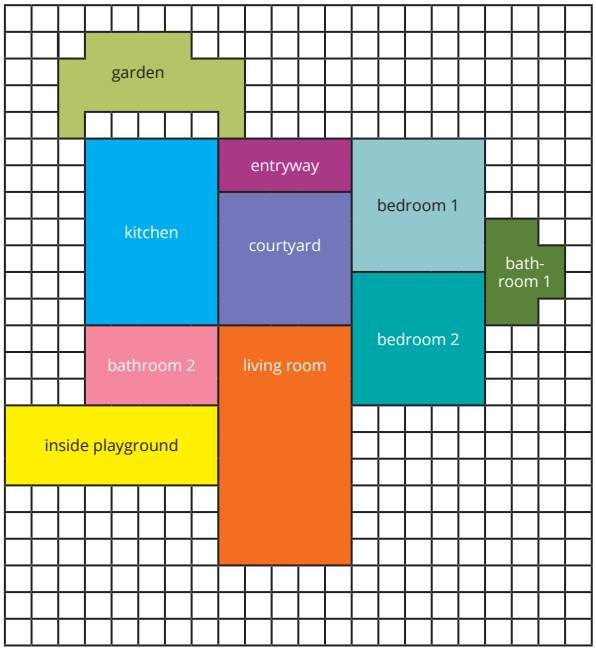
- Create a chart labeled Strategies for Multiplication Fluency either on the board or on a piece of chart paper.

For Lesson 102:

- Print sets of number cards 1–12 using the Number Cards 0–12 Blackline Master (one set per student plus one for the teacher).
  - Remove the 0 card from each deck.

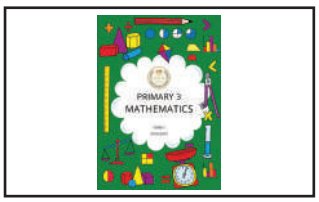
For Lesson 109:

- Gather a large sheet of grid paper or lightly draw a grid onto a large sheet of chart paper.
- Create a model of a "dream house" on grid paper. Label the rooms (for example, living room, kitchen, bedroom 1, and so on). Below is an example, but the model should reflect the needs and architecture of your community.



Materials Used

Student book

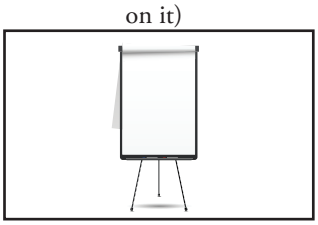


Strategies for Multiplication Fluency chart

Pencil

Thinking Like a Mathematician anchor chart

Large grid paper (or large chart paper with a grid lightly drawn on it)



Teacher-created dream house model

Crayons or colored pencils

Number cards 1–12 (one deck per student and one teacher deck)

Lesson 101 Overview

LESSON OVERVIEW

In Connect, students begin by reviewing two-step story problems involving the measurement of length. Students then discuss the definition of fluency and identify which facts they are comfortable with and which ones are still a challenge. The teacher records additional strategies for difficult facts, and then students practice multiplying. In this lesson, students practice thinking like a mathematician as they check work, redo incorrect problems, and challenge themselves to master tougher multiplication facts. At the end of the lesson, some of the responsibility of learning multiplication facts is transferred to the students as they brainstorm additional ways they could practice outside of school.

LEARNING OBJECTIVES

Students will:

- Develop fluency in multiplying one-digit numbers.
- Identify strategies to help them remember multiplication facts.

LESSON PREPARATION FOR THE TEACHER

- Display the Thinking Like a Mathematician anchor chart (if it is not already displayed).
- Create a chart labeled Strategies for Multiplication Fluency either on the board or on a piece of chart paper.

KEY VOCABULARY

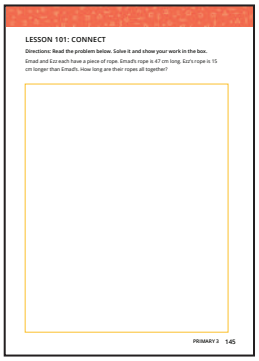
- Fluency

MATERIALS

- Thinking Like a Mathematician anchor chart
- Strategies for Multiplication Fluency chart
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 101: CONNECT

Directions: Read the problem below. Solve it and show your work in the box.

Emad and Ezz each have a piece of rope. Emad's rope is 47 cm long. Ezz's rope is 15 cm longer than Emad's. How long are their ropes all together?

PRIMARY 3 145

1. TEACHER DO: Have students open Mathematics Student Books to page Lesson 101: Connect and read the story problem to themselves.

STUDENTS DO: Turn to the Connect page and read the story problem silently.

TEACHER SAY: Turn to your Shoulder Partner and discuss what information you need to solve this problem and make sure you agree on what the problem is asking.

STUDENTS DO: Share thinking with a **Shoulder Partner**.

TEACHER DO: When students are finished talking, ask for volunteers to share the steps they think they need to take to solve the problem. Record their thinking on the board. Once you have discussed problem-solving strategies with the students, have them work independently to solve the problem.

STUDENTS DO: Work independently to solve a two-step story problem.

TEACHER DO: Give students 3 to 5 minutes to solve the problem and then ask several students to explain to the class how they solved the problem. Record their thinking on the board. Note if they are using strategies that make sense and are efficient. Students might just add the numbers to find Ezz's rope's length (47 + 15). Steps to correctly solve this problem may include:

- Ezz's rope's length = Emad's rope's length + 15 cm.
- Ezz's rope's length = 47 cm + 15 cm = 62 cm.
- Total length of both friends' ropes: 47 cm + 62 cm = 109 cm.

These types of responses allow students to begin to think algebraically in relation to having an unknown.

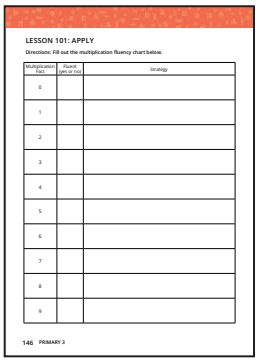
TEACHER SAY: You did a great job warming up your brain for today's work.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today our goal is to develop fluency with our multiplication facts. When you are fluent in a language, it is easy for you to speak the language easily and express yourself clearly. As you become fluent with your multiplication facts, they will become easier for you to remember and use. You will not have to get out blocks or draw pictures all the time. Please turn to your Shoulder Partner and share which numbers are the easiest for you to multiply and why.

STUDENTS DO: Share fluent facts with partners.


LESSON 101: APPLY

Directions: Fill out the multiplication fluency chart below.

Multiplication Fact	Fluent (yes or no)	Strategy
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		

146 PRIMARY 3

TEACHER SAY: Open your student book to page Lesson 101: Apply to complete the chart. Which multiplication facts are you fluent in and what are the strategies you use to master them? This chart is a place for you to show your thinking about your thinking. Good mathematicians think about their thinking. This is called metacognition. Your chart might not look like your friend's chart, and that is okay.

STUDENTS DO: Work in student books to identify fluent facts and note the strategies they use to master them.

TEACHER DO: After about 5 minutes, ask for volunteers to share a fluency fact and mastery strategy from the chart. Record effective strategies on the chart labeled Strategies for Multiplication Fluency. Try to record a strategy for each fact family.

Note to the Teacher: The following is a list of possible examples of strategies students may identify. If students do not identify them, explain them and add them to the chart.

- *2s: Count by 2s; check to make sure all products are even numbers; or I can add the other factor to itself (double it).*
  - *2 × 3—I can count by 2s three times; 2, 4, 6; or 3 + 3 = 6.*
- *3s: Doubles and add one more group.*
  - *6 × 3—I know that 6 × 2 = 12. I can then add another 6 to get 18.*
- *4s: Double the double.*
  - *8 × 4—I know that 8 × 2 = 16. I can then add 16 and 16 to get 32.*
- *5s: Count by 5s.*
- *6s: Multiply by 5 and add one more group.*
  - *7 × 6—I know that 7 × 5 = 35. I can then add another 7 to get 42.*
- *7s: Multiply by 5 and 2 and then add the products together (Distributive Property of Multiplication).*
  - *7 × 7—I know that 7 × 5 = 35 and 7 × 2 = 14. 35 + 14 = 49.*
- *8s: Double 4s facts.*
  - *6 × 8—I know that 6 × 4 = 24 and 24 + 24 = 48. (If unsure about 4s facts start with 2s.)*
- *9s: Finger trick from earlier lesson.*
- *10s: Add a 0 after the other factor.*
- *11s: Multiply by 10 and then add one more group (Distributive Property of Multiplication).*
  - *11 × 3 = (10 × 3) + (1 × 3) = 30 + 3 = 33.*
- *12s: Tens facts plus 2s facts (Distributive Property of Multiplication).*
  - *12 × 4—I know that 10 × 4 = 40 and 2 × 4 = 8. 40 + 8 = 48.*

TEACHER DO: Ask students to discuss why some facts are simpler than others. Choose two fact families they find challenging and have students try one of the strategies on the chart to build fluency.

2. TEACHER SAY: One of the best ways to build fluency with multiplication facts is to practice. Turn to page Lesson 101: Apply. I will give you 5 minutes to solve as many of these problems as you can. You do not need to go in order. Begin with your fluent facts first, and then go back and work to solve the more challenging ones.

STUDENTS DO: Work in student books to solve as many multiplication fact problems as they can in 5 minutes.

TEACHER DO: After 5 minutes, use an **Attention Getting Signal** and ask the class to stop working.

3. TEACHER SAY: Please turn to your Shoulder Partner and see if you solved any of the same problems. If you did, check to see if you agree on the answers. If you do not agree, talk through your thinking and redo the problem until you both agree.

STUDENTS DO: Work with partners on the work they have completed.

TEACHER DO: Give students 3 to 5 minutes to check work while walking around the room and noting which problems students chose to solve.

TEACHER SAY: I will now give you 3 more minutes to try and finish the page. If you finish early, please try the Challenge problems.

STUDENTS DO: Work in student books to solve the remaining multiplication problems. Students who finish early may try the Challenge problems.

4. TEACHER DO: At the end of 3 minutes use an **Attention Getting Signal** and ask the class to stop working. Go over the answers to the problems as a class with either the teacher reading the correct responses or calling on students to share. Ask students to circle any wrong answers. Then, give students time to go back and make corrections on new errors. Remind them that they can use the strategies listed on the chart. If any students got all of the problems correct, they can continue with the Challenge problems or help partners.

STUDENTS DO: Work in student books to correct new errors, try the Challenge problems, or help a partner.

TEACHER SAY: Great job today. Please put away your student books for Reflect.

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: Today you practiced building fluency with multiplication facts. At the beginning of class, you told your Shoulder Partner which facts you felt most fluent with and which facts you thought were more challenging. Did anyone's opinion change after today's practice? Did you feel more comfortable with different facts? Were there new challenges? Please give me a Thumbs Up if you would like to share. I will give you a minute to think.

STUDENTS DO: Give a **Thumbs Up** to volunteer. Selected students share thinking.

TEACHER DO: Brainstorm as a class other ways that students could practice fluency. Possible ideas include:

- Making flashcards.
- Asking someone at home to quiz them.
- Making repeated groups of items, such as beans, marbles, or coins, at home to visually see the facts. (This supports understanding and provides a visual way for some students to memorize facts.)
- Quizzing each other on facts during lunchtime or break.
- Creating a game that requires knowledge of multiplication facts.

TEACHER SAY: Developing fluency with your multiplication facts will help you become even better mathematicians. We will continue to practice in class but remember that it is a skill you can also practice outside of school.

Lesson 102 Overview

LESSON OVERVIEW

In this lesson, students begin with an error analysis problem that reinforces that multiplication is repeated addition. They then play a game to build understanding of multiplication and division relationships among the numbers in a fact family. They are then challenged to write equations to show those relationships. In Reflect, students explain the relationships they observed between multiplication and division fact families and consider how they might use those relationships to master multiplication and division facts.

LEARNING OBJECTIVES

Students will:

- Investigate relationships between numbers in multiplication and division fact families.
- Write equations to represent multiplication and division relationships within a fact family.
- Explain how they can use the relationship between multiplication and division fact families to master math facts.

KEY VOCABULARY

- Dividend
- Divisor
- Fact family
- Factor
- Quotient
- Product

MATERIALS

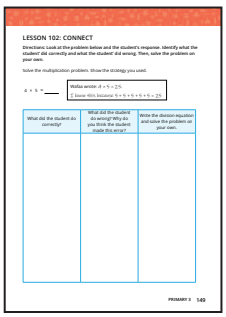
- Number cards 1–12 (one deck per student and one teacher deck)
- Mathematics Student Book and pencil

LESSON PREPARATION FOR THE TEACHER

- Print sets of number cards 1–12 using the Number Cards 0–12 Blackline Master (one set per student plus one for the teacher).
  - Remove the 0 card from each deck.

Connect (10 to 15 minutes)

Directions


LESSON 102: CONNECT

Directions: Look at the problem below and the student's response. Identify what the student did correctly and what the student did wrong. Then, solve the problem on your own.

Solve the multiplication problem. Show the strategy you used.

6 × 5 = ___

Wafaa wrote: 6 × 5 = 25
(I know this because 5 + 5 + 5 + 5 + 5 = 25)

What did the student do correctly?	What did the student do wrong? Why do you think the student made this error?	Write the correct equation and solve the problem on your own.

PRIMARY 3 149

1. TEACHER DO: Have students open Mathematics Student Books to page Lesson 102: Connect and complete the error analysis review problem. After 3 to 5 minutes, have students share thinking with a **Shoulder Partner**.

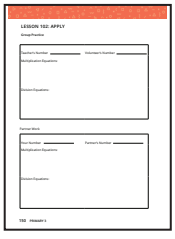
STUDENTS DO: Turn to the Connect page and work to solve the error analysis review problem. When done, share solutions and thinking with a **Shoulder Partner**.

TEACHER DO: Use **Calling Sticks** to choose one or two students to share what the error was as well as what was done correctly.

TEACHER SAY: **Great job. Remember that although multiplication is repeated addition, in this problem Wafaa added too many 5s.**

Learn (35 to 45 minutes)

Directions


LESSON 102: APPLY

Group Practice

Teacher's Number _____ Volunteer's Number _____

Multiplication Equations:

Division Equations:

Partner Work

Your Number _____ Partner's Number _____

Multiplication Equations:

Division Equations:

150 PRIMARY 3

1. TEACHER SAY: **Today our learning goal is to use the relationship between factors and quotients to practice multiplying and dividing. To do this, we will play a game called Flip and Record. You will play this game with a partner. Please open your student books to page Lesson 102: Apply and let's try the group practice together.**

STUDENTS DO: Open student books to the Apply page and prepare for group practice.

TEACHER SAY: **You and your partner will each have a stack of number cards from 1 to 12. Raise your hand if you would like to volunteer to be my partner for our guided practice.**

STUDENTS DO: Raise hands to volunteer. Selected student goes to the front of the room.

TEACHER DO: Give the volunteer a deck of number cards.

TEACHER SAY: **To play the game, both of us will turn over a card.**

STUDENTS DO: Student turns over a number card.

TEACHER DO: Turn over a number card.

TEACHER SAY: **Record the numbers in your math book. I will record my number _____ (say number) on the board. You record my number where it says Teacher's Number and _____'s (name of volunteer) number _____ (say number) where it says Volunteer's Number. Please do that now.**

STUDENTS DO: Record numbers. Volunteer sits down.

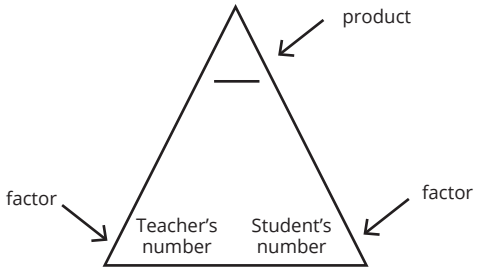
2. TEACHER SAY: **In your books, it also says Multiplication Equations and Division Equations. You are to take these two numbers and write and solve two multiplication equations and two division equations. I can draw a fact family triangle to help me understand the multiplication relationships.**

TEACHER DO: Draw a large triangle on the board.

TEACHER SAY: **Remember, in my fact family triangle, I write the two factors in the bottom angles and the product, or multiplication answer, in the top angle. What is the product of these two numbers?**

STUDENTS DO: Call out the answer.

TEACHER DO: Record the factors and the product in the triangle. Label the factors and the product as shown.



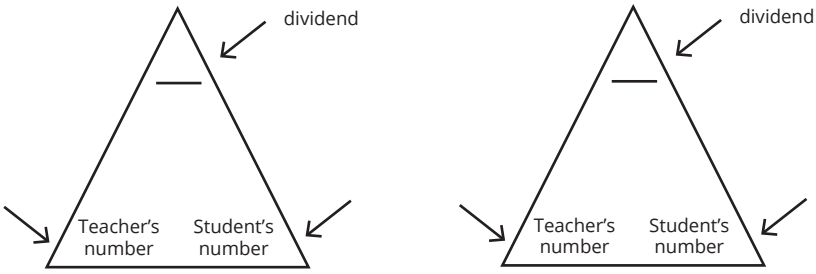
TEACHER SAY: **Write two multiplication equations in your book using these factors and the product.**

STUDENTS DO: Record two multiplication equations.

TEACHER DO: Go over the answers with the class. Remind them that the Commutative Property of Multiplication tells us that the order of the factors does not matter.

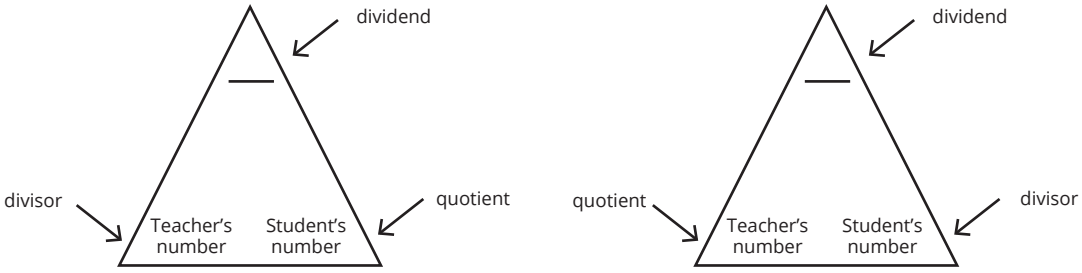
3. TEACHER SAY: **We can also draw fact family triangles to help us with division problems.**

TEACHER DO: Draw two additional copies of the fact family triangle (with all of the numbers, but without the multiplication labels). Label the top of each triangle as the dividend as shown.



TEACHER SAY: In division, the number being divided up is called the DIVIDEND. The number we are dividing by is called the DIVISOR, and the number that is the answer is called the QUOTIENT.

TEACHER DO: Label the two new triangles, describing how the divisor and quotient change.



TEACHER SAY: Write two division equations to show the relationship between these three numbers. Try it now in your book where it says Division Equations.

STUDENTS DO: Write two division equations.

TEACHER DO: Call on students to share answers, explain thinking, and record equations on the board. If needed, play another round of the game together to reinforce the concepts.

4. TEACHER SAY: You will now play this game with your Shoulder Partner. Remember, you can always draw a fact family triangle to help you if you get stuck. However, you do not have to draw a triangle if you do not need to. Once you receive your cards, you may begin playing.

TEACHER DO: Hand out decks of number cards to each student.

STUDENTS DO: Play the game with partners. Record work in the student book.

TEACHER DO: Walk around the room and monitor students as they play the game and record equations. Are they able to come up with equations easily? Which students use the fact family triangles for support?

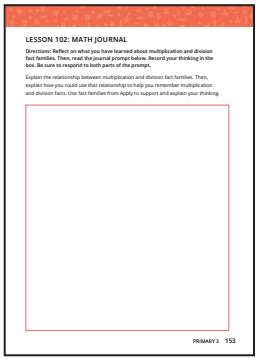
TEACHER SAY: You did great work today showing the relationship between multiplication and division while building your fact fluency.

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: Today we practiced multiplication and division facts and used the relationship between multiplication and division fact families to write equations. Turn to your Shoulder Partner and tell each other what you know about the relationship between multiplication and division fact families. Use some of the fact families you created today as examples to explain your thinking. I will give you 2 minutes.

STUDENTS DO: Discuss understanding of the relationship between multiplication and division fact families with a partner. Use examples to support thinking.


LESSON 102: MATH JOURNAL

Directions: Reflect on what you have learned about multiplication and division fact families. Then, read the journal prompt below. Record your thinking in the box. Be sure to respond to both parts of the prompt.

Explain the relationship between multiplication and division fact families. Then, explain how you could use that relationship to help you remember multiplication and division facts. Use fact families from Apply to support and explain your thinking.

PRIMARY 2 153

TEACHER SAY: Now turn to page Lesson 102: Math Journal and read the journal prompt to yourself.

STUDENTS DO: Turn to the journal page and read the prompt silently.

TEACHER DO: Make sure students understand the prompt before beginning to write responses. Walk around the room, reading students' responses as they work. Be sure to collect journals and read students' entries to assess whether or not they understand and can use the relationship between multiplication and division fact families to learn math facts.

Lesson 103 Overview

LESSON OVERVIEW

In this lesson, students begin by finding the unknown factor in fact family triangles and equations. This reinforces what they have learned about solving for the unknown and prepares them for Learn. During Learn, students write equations to represent story problems with one unknown number, using a symbol to represent the unknown number. They then solve the equations and may use a triangle fact family to help them see the relationship between the numbers.

LEARNING OBJECTIVES

Students will:

- Use a symbol to represent an unknown number in an equation.
- Write equations with one unknown number to represent story problems.
- Solve equations with one unknown.

LESSON PREPARATION FOR THE TEACHER

No additional preparation needed.

KEY VOCABULARY

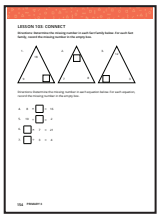
- Equation
- Symbol
- Unknown

MATERIALS

- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions



1. TEACHER DO: Have students open Mathematics Student Books to page Lesson 103: Connect and read the directions for both sections to themselves. Make sure students understand the directions and have them begin working independently to complete the activity. After 5 to 7 minutes, review the answers as a class and check students' understanding. If time allows, ask volunteers to explain strategies for determining the unknown number.

TEACHER SAY: Let's continue to work on determining unknown numbers in Learn.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today our goal is to determine the missing number in equations. If we are writing equations, what could we write to represent the missing number? Raise your hand if you have an idea.

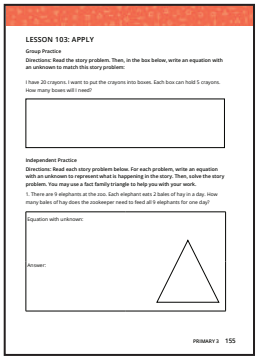
STUDENTS DO: Raise hand to volunteer. Selected students share thinking.

TEACHER DO: Record students' ideas on the board.

TEACHER SAY: Good thinking. We can use symbols to represent the unknown numbers in equations. What is a symbol? What are some symbols we use in mathematics? Turn and Talk to your Shoulder Partner about the definition of symbol and give examples.

STUDENTS DO: Talk to partner about the meaning of the word symbol and share examples.

TEACHER DO: Wait 1 to 2 minutes and then use **Calling Sticks** to choose two or three students to explain the definition of a symbol and give an example. Students should understand that a symbol is a mark or sign used to represent something else. Symbols in math include the signs for operations (+, -, x, and ÷) as well as symbols for greater than and less than.


LESSON 103: APPLY

Group Practice

Directions: Read the story problem. Then, in the box below, write an equation with an unknown to match this story problem:

I have 20 crayons. I want to put the crayons into boxes. Each box can hold 5 crayons. How many boxes will I need?

Independent Practice

Directions: Read each story problem below. For each problem, write an equation with an unknown to represent what is happening in the story. Then, solve the story problem. You may use a fact family triangle to help you with your work.

1. There are 9 elephants at the zoo. Each elephant eats 2 bales of hay in a day. How many bales of hay does the zookeeper need to feed all 9 elephants for one day?

Equation with unknown:

Answer:

PRIMARY 3 155

TEACHER SAY: Great. We use many different symbols in math. During Connect, we used a symbol in our triangle fact families for the unknown. What was that symbol? Whisper your answer.

STUDENTS DO: Whisper answers.

2. TEACHER SAY: Squares were used to represent the missing numbers. Mathematicians use symbols to represent an unknown. Please open your student books to page Lesson 103: Apply to the Group Practice section and read the directions to yourself.

STUDENTS DO: Open student books to the Apply page and read the directions silently.

TEACHER SAY: Talk to your Shoulder Partner about what this problem is asking. Then, work together to write an equation to represent what is happening in the story problem. Since we do not know one of the numbers, you and your partner should use a symbol to represent the unknown number. Then, solve the problem. You may draw a fact family triangle to help you. I will give you 3 minutes, and then we will go over your thinking as a class.

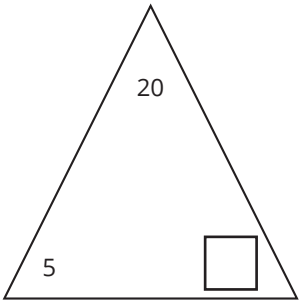
STUDENTS DO: Work with a partner to complete the Group Practice problem in the student book.

TEACHER DO: Wait 3 to 5 minutes for students to work on the problem and then call on several students to share thinking. Explain and record thinking on the board. Although determining the answer to the problem is important, the critical learning is figuring out what is going on in the problem in order to determine the missing number.

Note to the Teacher: If this process is unclear to students, proceed to the explanation below. Otherwise, skip the explanation and have students begin working on their own.

3. TEACHER SAY: We know two numbers from the story: There are 20 crayons, and each crayon box can hold 5 crayons. We do not know one of the numbers—how many boxes we need. If we put these numbers into a fact family triangle, it looks like this, with the unknown represented by a box.

TEACHER DO: Draw the triangle on the board.



TEACHER SAY: There are several equations we could write:

- $20 \div \square = 5$
- $20 \div 5 = \square$
- $\square \times 5 = 20$
- $5 \times \square = 20$

Note to the Teacher: All of these are acceptable ways to solve the problem, depending on how students visualize the mathematical process of putting the crayons into boxes.

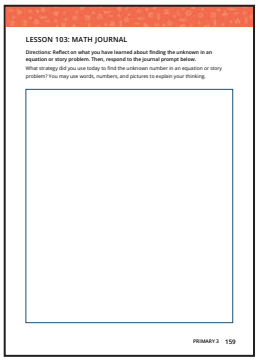
TEACHER DO: Answer students' questions to clear up misconceptions. Make sure students understand the directions and then have them begin working independently to solve the problems in the

student book. Walk around the class, observing students as they solve problems. Help students who are struggling and bring them into a smaller group to work together. Near the end of Learn, use an **Attention Getting Signal** and go over the answers together. If time allows, have students model and explain solutions on the board.

TEACHER SAY: **You did a great job today working to find the unknown in an equation and in a story problem. Please keep your student book out for Reflect.**

Reflect (5 to 10 minutes)

Directions


LESSON 103: MATH JOURNAL

Directions: Reflect on what you have learned about finding the unknown in an equation or story problem. Then, respond to the journal prompt below.

What strategy did you use today to find the unknown number in an equation or story problem? You may use words, numbers, and pictures to explain your thinking.

PRIMARY 2 159

1. TEACHER SAY: **For today's Reflect, please think about a strategy you used today in class during Learn. How did you figure out how to write an equation with an unknown? Please write about that strategy in your student books on page Lesson 103: Math Journal.**

STUDENTS DO: Turn to the journal page and respond to the prompt.

TEACHER DO: Be sure to collect students' books to read journal responses. They will provide valuable information about students' learning related to unknown numbers.

TEACHER SAY: **You worked hard today to learn a challenging new skill. I am proud of you.**

Lesson 104 Overview

LESSON OVERVIEW

This lesson begins with a review of mass as students solve a two-step story problem. Students should be encouraged to think about what they know and what they need to find out in each situation. Often, two-step story problems confuse students who think they can take a shortcut and just drop the numbers into an equation. In Learn, students discuss when they use multiplication in life outside of school and think about how to write multiplication story problems. Students are given equations to write story problems to ensure practice with challenging facts and to scaffold the process of writing. Consider your students' proficiency with multiplication and differentiate accordingly. You can alter the equations in the student book or let some students use their own numbers to create equations similar to the Challenge problem. In Reflect, students discuss what is challenging about writing multiplication story problems.

LESSON PREPARATION FOR THE TEACHER

No additional preparation needed.

LEARNING OBJECTIVES

Students will:

- Write story problems that represent given equations.
- Apply strategies to solve multiplication story problems.

KEY VOCABULARY

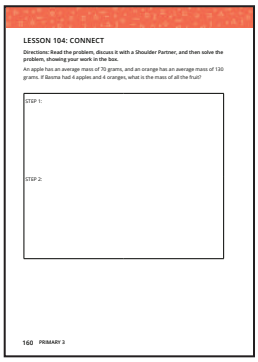
- Multiplication
- Product
- Story problem

MATERIALS

- Thinking Like a Mathematician anchor chart
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 104: CONNECT

Directions: Read the problem, discuss it with a Shoulder Partner, and then solve the problem, showing your work in the box.

An apple has an average mass of 70 grams, and an orange has an average mass of 130 grams. If Ilasma had 4 apples and 4 oranges, what is the mass of all the fruit?

STEP 1:

STEP 2:

160 PRIMARY 3

1. TEACHER DO: Have students open Mathematics Student Books to page Lesson 104: Connect and read the directions to themselves. Once students understand the directions, have them work with a partner to solve the review problem.

STUDENTS DO: Turn to the Connect page and work with a partner to solve the measurement review problem.

TEACHER DO: After 2 to 3 minutes, ask volunteers to share with the larger group how they solved the problem. As students share, write the steps described using step 1 and step 2, clearly recording the problem-solving process on the board. Be sure to ask if others solved the problem in a different way.

Note to the Teacher: Although this is a two-step story problem, students may see different ways to solve, such as the following:

- *Students may first add 70 and 130 and then multiply by 4 to have a total mass of 800 grams.*
- *Students may add 70 four times and 130 four times and then combine to get 800 grams.*
- *Students may add 70 and 130 and then add four 200s to get 800 grams.*

Some students may solve using more than two steps, which is acceptable as an effective strategy (provided they can explain it).

TEACHER SAY: Mathematicians know that often there are many ways to solve problems. It is important that we are able to clearly explain the steps we have taken to solve a problem. This helps confirm our thinking and helps us teach others. Keep out your books for Learn.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Let's start today thinking about when we multiply in real life. When do we need to multiply? Think for a minute and then give me a Thumbs Up to share.

STUDENTS DO: Give a **Thumbs Up** to volunteer. Selected students share where and when multiplication might be used in the real world.

TEACHER DO: After a minute, call on two or three students to share where or when they might use multiplication in the real world. They can give examples of situations like those below or more general comments, such as, "When I have equal groups of things and more than one group." Other examples may include:

- Having multiple bags containing an equal number of things.
- Determining how much money you might make if you work a certain number of hours for a fixed amount of money per hour.
- Figuring out how many cookies will you need if you want to give each family member two cookies.
- Determining distance traveled, such as if you walk 6 miles per day, how many miles will you walk in a week?
- Solving scaling problems: If Amir has a piece of ribbon that is 4 times longer than Abdallah's 20-centimeter piece, how long is Amir's ribbon?

2. TEACHER SAY: Great ideas. Math is all around us, and multiplication helps us do quick counts of groups of things. It is a tool in our mathematical toolbox that helps us efficiently make sense of our world. Today we are going to write our own story problems. Let's practice this together first. On the board, I have written a multiplication equation. Take a minute to talk to your Shoulder Partner about a story problem that could be represented by the math fact 6 × 9. Give me a Thumbs Up to share your story problem.

STUDENTS DO: Talk to a partner about a problem that could be represented by the math fact 6 × 9. Selected students share problems and explain thinking.

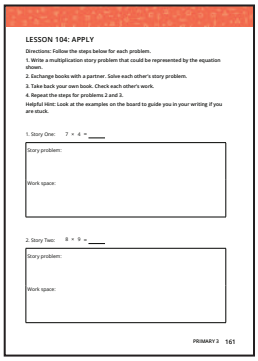
TEACHER DO: Call on two or three students to share story problems. Writing story problems is challenging for students, so as they share, record their thinking on the board to help them confirm that the problem is a multiplication situation. Clarify that multiplication problems may state that there is the same amount of something in equal groups, or the same thing happening over multiple days, such as you walk 2 miles or eat 2 apples.

TEACHER SAY: These are all examples of multiplication story problems that could be represented by the math fact 6 × 9. I am going to leave these on the board as examples for you to reference as you get ready to write your own story problems. Before we start writing, what do we call the answer to a multiplication problem? Whisper into your hand.

STUDENTS DO: Whisper answers.

TEACHER SAY: What is the product of 6 × 9?

STUDENTS DO: Whisper answers.


LESSON 104: APPLY

Directions: Follow the steps below for each problem.

1. Write a multiplication story problem that could be represented by the equation shown.
2. Exchange books with a partner. Solve each other's story problem.
3. Take back your own book. Check each other's work.
4. Repeat the steps for problems 2 and 3.

Helpful Hint: Look at the examples on the board to guide you in your writing if you are stuck.

1. Story One: 7 × 4 = ___

Story problem:

Work space:

2. Story Two: 8 × 9 = ___

Story problem:

Work space:

PRIMARY 2 161

3. TEACHER SAY: The product is 54. Turn to page Lesson 104: Apply and read the directions to yourself.

STUDENTS DO: Turn to the Apply page and read the directions silently.

TEACHER DO: Go over the directions with students and answer any questions they have. Tell students to try the Challenge problem if they finish early.

STUDENTS DO: Ask clarifying questions and then spend the rest of the Learn time writing original multiplication story problems, exchanging books with a partner, solving the partner's problems, and then checking each other's work. Students who finish early may try the Challenge problem.

TEACHER DO: As students work, walk around the room and ask students to share stories with you. If students are struggling, it is often helpful to have them verbally share first and then write what they shared. Make sure students are writing problems that represent multiplication situations. Note students who might need some extra support later or pull those students and write a few problems together as a group.

TEACHER SAY: **Good work today. Let's prepare for Reflect.**

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: **Today we wrote our own multiplication story problems for a given equation and then solved each other's problems. For Reflect, think about what was challenging about writing your own problems and what was easy. Give me a Thumbs Up when you are ready to share your ideas, and we will Popcorn around to hear your thinking.**

TEACHER DO: Allow 1 to 2 minutes for **Think Time** and then use **Popcorn** to hear from as many students as time permits.

STUDENTS DO: Think about what was easy and what was challenging about writing multiplication story problems. Share thinking when selected.

TEACHER SAY: **Writing story problems can be challenging, but we know from our Thinking Like a Mathematician chart that mathematicians persevere to solve challenges (point to chart). You all are hardworking mathematicians, and in our next math class, we will work on writing some division problems.**

Lesson 105 Overview

LESSON OVERVIEW

In this lesson, students begin by playing a division game, partitioning themselves into different groups of equal size. In Learn, students discuss when they use division in life and think about how to write division story problems. Students are given equations to write story problems to ensure practice with challenging facts and to scaffold the process of writing. Consider your students' proficiency with division and differentiate accordingly. You can alter the equations in the student book or let some students use their own numbers to create equations similar to the Challenge problem. In Reflect, students collaborate to create a class definition of division.

LEARNING OBJECTIVES

Students will:

- Write story problems that represent given equations.
- Apply strategies to solve division story problems.
- Define division.

LESSON PREPARATION FOR THE TEACHER

- No additional preparation needed.

KEY VOCABULARY

- Division
- Quotient

MATERIALS

- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions

1. TEACHER SAY: For Connect today we are going to play a division game. Who can remind us what division means, how it is different from multiplication, and what we call the answer to a division equation? Turn and discuss with your Shoulder Partner and then give me a Thumbs Up if you want to share your thinking.

STUDENTS DO: Discuss with a partner and then give a **Thumbs Up** to volunteer. Selected students share understanding of division, explain how it is different from multiplication, and identify the word for an answer in a division equation.

Note to the Teacher: Responses may include:

- *Sharing a large group into smaller equal parts.*
- *Breaking up a number into equal parts.*
- *It is the opposite (inverse) of multiplication.*
- *Quotient is the word for the answer to a division problem.*

TEACHER SAY: Great. Division is the opposite of multiplication. When we divide, we take a group and split it, or share it, into equal parts. This game will get us thinking about that idea. I will use Calling Sticks to choose 12 students to stand at the front of the room. Then, I will call a number, and the 12 students will silently get into that number of equal groups. Let's try it.

TEACHER DO: Choose 12 students using **Calling Sticks**. Once students are standing, ask them to silently form 3 equal groups.

STUDENTS DO: Selected students cooperate silently to move into 3 equal groups.

TEACHER SAY: Nice job. How many students are in each group? Lean and Whisper.

STUDENTS DO: Whisper answers.

TEACHER SAY: **We had 12 students and we divided them into 3 equal groups. Each group has 4 students. Who can write this for us as a division problem on the board? Raise your hand.**

STUDENTS DO: Raise hand to volunteer. Selected student records a matching equation on the board.

TEACHER SAY: **Nice job. Let's try it again.**

TEACHER DO: Repeat the process, having the 12 students move into 6 equal groups, 4 equal groups, 2 equal groups, 12 equal groups, and 1 group. Each time, have a volunteer record a new division equation. If time allows, choose 12 new students each time or halfway through.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: **Today our learning goal is to write and solve division story problems as we did in our last class with multiplication story problems. We just practiced some division with our game. Now, let's think about how we might use division in a story problem. When in the real world do we need to use division? Think for a minute and then give me a Thumbs Up to share your thinking.**

TEACHER DO: Provide **Wait Time** and then call on two or three students to share where or when they might use division in the real world. Answers may include:

- Sharing a quantity of food, like a group of cookies or apples.
- Figuring out how much money each person might receive from a larger amount of money.
- Determining how to organize a group of materials, such as books onto a shelf in equal amounts.

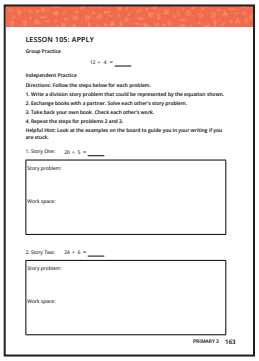
STUDENTS DO: Give a **Thumbs Up** to volunteer. Selected students share where and when division might be used in the real world.

2. TEACHER SAY: **Great ideas. Division helps us all the time decide how to share or break up larger groups into smaller equal parts. Today we are going to write our own story problems. Let's practice this together first. Take a minute to talk to your Shoulder Partner about a story problem that could be represented by the math fact 12 ÷ 4. Give me a Thumbs Up to share your story problem.**

STUDENTS DO: Talk to a partner about a problem that could be represented by the math fact 12 ÷ 4. Selected students share problems and explain thinking.

TEACHER DO: Call on three or four students to share story problems. As with the multiplication story problems from Lesson 104, as students share, record on the board and ensure that the problem is a division situation. Clarify that division problems may include the words share, divide, equal groups, split, and so on.

TEACHER SAY: **These are all examples of division story problems that we could use the math fact 12 ÷ 4 to solve. I am going to leave these up on the board as examples for you to reference as you get ready to write your own story problems. But before we start, what is the quotient of 12 ÷ 4? Whisper into your hand. Then write it in your book.**


LESSON 105: APPLY

Group Practice

12 ÷ 4 = ___

Independent Practice

Directions: Follow the steps below for each problem.

1. Write a division story problem that could be represented by the equation shown.
2. Exchange books with a partner. Solve each other's story problem.
3. Take back your own book. Check each other's work.
4. Repeat the steps for problems 2 and 3.

Helpful Hint: Look at the examples on the board to guide you in your writing if you are stuck.

1. Story One: 20 ÷ 5 = ___

Story problem:

Work space:

2. Story Two: 24 ÷ 6 = ___

Story problem:

Work space:

PRIMARY 2 163

STUDENTS DO: **Whisper** answers then record in the book.

3. TEACHER SAY: **12 ÷ 4 = 3. Now it is your turn to try some on your own. Open your Mathematics Student Book to page Lesson 105: Apply and read the directions to yourself.**

STUDENTS DO: Turn to the Apply page and read the directions silently.

TEACHER DO: Go over the directions with students and answer any questions they have. Tell students to try the Challenge problem if they finish early.

STUDENTS DO: Ask clarifying questions and then spend the rest of the Learn time writing original division story problems, exchanging books with a partner, solving the partner's problems, and then checking each other's work. Students who finish early may try the Challenge problem.

TEACHER DO: As students work, walk around the room and ask students to share stories with you. If students are struggling, it is often helpful to have them verbally share first and then write what they shared. Make sure students are writing problems that represent division situations. Note students who might need some extra support later or pull those students and write a few problems together as a group.

TEACHER SAY: **Amazing work today. That was a challenging activity. Let's prepare for Reflect.**

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: **Today we wrote division word problems. For Reflect, let's think about a definition for the word division. Turn to your Shoulder Partner and discuss what you could write in your student books as a definition and an example of the word.**

STUDENTS DO: Talk to a partner about a definition and an example for division.

TEACHER DO: Wait 1 to 2 minutes and then, as a group, create a definition and an example that can be recorded on the board and in student books. Example:

Division is breaking a number up into an equal number of parts. Example: 20 divided by 4 = _____. If you take 20 things and put them into 4 equal groups, there will be 5 things in each group.

STUDENTS DO: Record the class definition and example of division in the Math Vocabulary section.

TEACHER SAY: **You should be very proud of the work you did today writing your own division story problems.**

Lesson 106 Overview

LESSON OVERVIEW

In this lesson, students solve a two-step story problem involving addition and subtraction. In Learn, students review the difference between area and perimeter and then work to solve a variety of area and perimeter problems, working toward Reflect, where they create a definition for each word and record the definitions in the Math Vocabulary section of the student book. Perimeter and area have been taught and practiced in earlier lessons, but this review helps solidify the difference as students tackle more complex problems and questions in the next few lessons, culminating with a perimeter and area project in Lessons 109 and 110.

LEARNING OBJECTIVES

Students will:

- Solve a two-step story problem involving addition and subtraction.
- Find the area and perimeter of quadrilaterals.
- Find the perimeter of shapes that are not quadrilaterals.
- Collaborate to write class definitions of area and perimeter.

LESSON PREPARATION FOR THE TEACHER

- No additional preparation needed.

KEY VOCABULARY

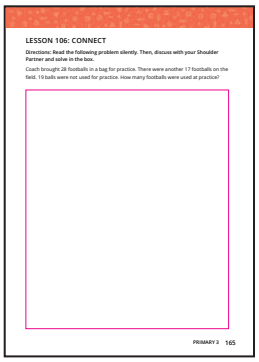
- Area
- Perimeter
- Square units

MATERIALS

- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 106: CONNECT

Directions: Read the following problem silently. Then, discuss with your Shoulder Partner and solve in the box.

Coach brought 28 footballs in a bag for practice. There were another 17 footballs on the field. 19 balls were not used for practice. How many footballs were used at practice?

PRIMARY 3 165

1. TEACHER DO: Have students open Mathematics Student Book to page Lesson 106: Connect and read the directions to themselves. Have students talk to a **Shoulder Partner** about what the problem is asking them to figure out and how they might solve it. Then, have students work independently to solve the problem.

STUDENTS DO: Discuss problem-solving strategies with a partner. Then, work independently to solve the problem.

TEACHER DO: After 3 to 5 minutes, ask for volunteers to share with the larger group how they solved the problem. As they share, record the steps described, labeling them Step 1 and Step 2, clearly recording the process on the board. Be sure to ask if other students solved the problem differently.

Note to the Teacher: Students may share something like the following:

- *Students might add 28 and 17 and then subtract 19, for 26 footballs being used for practice.*
- *Students might first subtract 19 from 28 and then add the 9 balls to the 17, for 26 that were used for practice.*

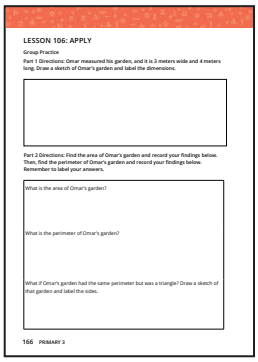
TEACHER SAY: Good job thinking through the steps and taking your time. Keep out your books for Learn.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today our learning objective is to revisit two types of measurement that we discussed earlier in the year—perimeter and area. What is the difference between perimeter and area? Turn to your Shoulder Partner and share your thinking. Raise your hand when you are ready to share.

STUDENTS DO: Discuss with a partner the difference between perimeter and area. Raise hands when ready to share. Selected students explain the difference between perimeter and area.


LESSON 106: APPLY

Group Practice

Part 1 Directions: Omar measured his garden, and it is 3 meters wide and 4 meters long. Draw a sketch of Omar's garden and label the dimensions.

Part 2 Directions: Find the area of Omar's garden and record your findings below. Then, find the perimeter of Omar's garden and record your findings below. Remember to label your answers.

What is the area of Omar's garden?

What is the perimeter of Omar's garden?

What if Omar's garden had the same perimeter but was a triangle? Draw a sketch of that garden and label the sides.

166 PRIMARY 3

2. TEACHER SAY: Great thinking. Turn in your student book to page Lesson 106: Apply. Read the directions and work on your own to complete Part 1 of the activity. Give me a Thumbs Up when you are done with your sketch.

STUDENTS DO: Turn to the Apply page. Read the problem, draw a sketch of the garden, and label the dimensions. Give a **Thumbs Up** when done working.

TEACHER DO: Allow **Wait Time** for students to read and sketch. Then, call on a student to redraw their sketch on the board and label the dimensions. Have students check their own work to ensure that they have labeled the width and length correctly. If needed, review width versus length.

TEACHER SAY: How would you find the area of Omar's garden? How would you find the perimeter? Turn to your Shoulder Partner and share your thinking. Give me a Thumbs Up when you are ready to share.

STUDENTS DO: Share thinking with a partner. Selected students explain how to find area and perimeter.

TEACHER SAY: Using your sketch, find the area and perimeter of Omar's garden. Give me a Thumbs Up when you are ready to share.

STUDENTS DO: Work independently to calculate the perimeter and area of Omar's garden.

TEACHER DO: After about 3 minutes, call on students to share thinking. For perimeter, students may add 3 + 4 and then double or add 3 + 3 + 4 + 4 for a total of 14 meters. For area, students may multiply 3 × 4 for a total of 12 square meters. Some may draw in the square units to help them find the area.

3. TEACHER SAY: Good job. We know how to find the perimeter of rectangles and squares, but what if Omar's garden was not a rectangle? What if Omar's garden was a triangle? Can you draw a triangular garden that still has the same perimeter as Omar's rectangular garden? Give me a Thumbs Up when you are finished.

STUDENTS DO: Draw a triangular garden with the same perimeter as Omar's rectangular garden. Label each side. Give a **Thumbs Up** when finished. Selected students draw triangles on the board, labeling each side.

TEACHER SAY: There are many possibilities, and when we find perimeter, we do not always have rectangles or squares or even quadrilaterals. We can find the perimeter of any shape if we know the outside measurements. Today you will work with a partner, since it has been a little while since we worked with perimeter and area. Together you will solve a variety of perimeter and area problems. Not all of these are quadrilaterals, so take your time and show your thinking. As you work, think about the difference between area and perimeter. Let's use Hands Up Pair Up to find a partner. If you finish early, you and your partner may try the Challenge problem.

STUDENTS DO: Find a partner and work together to solve the Partner Practice problems in the student book. Students who finish early may try the Challenge problem.

TEACHER DO: Walk around and observe students as they solve the perimeter and area problems. Work in a small group with students who are struggling.

TEACHER SAY: **I saw so much hard work today. Keep out your student books for Reflect.**

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: **Today we reviewed finding area and the perimeter in a variety of story problems. For Reflect, let's define each word. What do these measurements have in common and how are they different? Think for a minute. Raise your hand when you are ready to share your ideas.**

STUDENTS DO: Think quietly for a minute. Raise hands to volunteer. Selected students share thinking.

TEACHER DO: Work with students to create class definitions for perimeter and area. Record the definitions on the board. They might look something like this:

Perimeter is the length around the outside of a two-dimensional shape.
Area is the space within the perimeter of a given shape.

TEACHER SAY: **Please copy our class definitions of these math terms in the Math Vocabulary section of your student book. We will keep exploring these measurements in the coming lessons.**

STUDENTS DO: Record the class definitions of area and perimeter in the Math Vocabulary section of the student book.

Lesson 107 Overview

LESSON OVERVIEW

In this lesson, students begin with an error analysis problem related to area and perimeter. In Learn, students continue to extend understanding of area and perimeter through the exploration of irregular shapes. Given the perimeter of a shape, they work to find missing side measures and then to determine the area of the shape. This entails students being able to decompose a larger shape into two or more smaller quadrilaterals. They also work to find the perimeter of shapes with missing side lengths. Finally, they reflect on and share thinking about the statement "Rectangles that have the same perimeter always have the same area."

LEARNING OBJECTIVES

Students will:

- Calculate the area of a shape when given the perimeter.
- Determine the missing side lengths of complex shapes when given the perimeter.
- Determine the missing side lengths of complex shapes to determine the perimeter.
- Decompose complex shapes into smaller quadrilaterals to determine the area.

LESSON PREPARATION FOR THE TEACHER

- No additional preparation needed.

KEY VOCABULARY

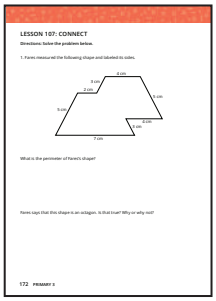
- Complex shape
- Review area and perimeter vocabulary as needed.

MATERIALS

- Thinking Like a Mathematician anchor chart
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 107: CONNECT

Directions: Solve the problem below.

1. Paxie measured the following shape and labeled its sides.

What is the perimeter of Paxie's shape?

Paxie says that this shape is an octagon. Is that true? Why or why not?

172 PRIMARY 5

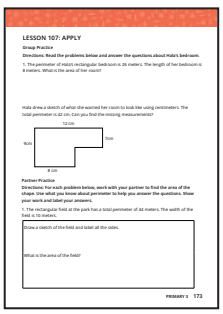
1. TEACHER DO: Have students open Mathematics Student Books to page Lesson 107: Connect and read the directions to themselves. Make sure students understand the directions and have them begin working. When they are finished, they should check answers with a **Shoulder Partner**.

STUDENTS DO: Turn to the Connect page, work on the Connect problem, and compare work with a partner.

TEACHER DO: Give students 5 to 7 minutes to work on the problem and discuss with a partner. Then, call on several students to share work with the class, being sure to clarify that the shape is an octagon. A regular octagon has eight equal sides, but any closed shape with eight straight sides and eight angles is considered an octagon.

Learn (35 to 45 minutes)

Directions


LESSON 107: APPLY

Group Practice

Directions: Read the problems below and answer the questions about Hala's bedroom.

1. The perimeter of Hala's rectangular bedroom is 26 meters. The length of her bedroom is 8 meters. What is the area of her room?

Hala drew a sketch of what she wanted her room to look like using centimeters. The total perimeter is 32 cm. Can you find the missing measurements?

Partner Practice

Directions: For each problem below, work with your partner to find the area of the shape. Use what you know about perimeter to help you answer the questions. Show your work and label your answers.

1. The rectangular field at the park has a total perimeter of 44 meters. The width of the field is 10 meters.

Draw a sketch of the field and label all the sides.

What is the area of the field?

PRIMARY 5 173

1. TEACHER SAY: **Today our learning goal is to determine the area of a shape when we are given the perimeter. We will explore this with quadrilaterals and apply it to more complex shapes. Please turn to page Lesson 107: Apply and read the directions and problem under Group Practice. When you are finished, give me a Thumbs Up if you would like to come up and draw a sketch of Hala's bedroom.**

STUDENTS DO: Turn to the Apply page to read the directions and the problem silently. Give a **Thumbs Up** to volunteer. Selected student draws a sketch of the room on the board and labels the sides.

TEACHER DO: Ask the volunteer to explain how they determined the missing side lengths. Encourage them to use math vocabulary in the explanation if possible. Confirm accurate explanations and correct any misconceptions.

TEACHER SAY: Now that we know the length is 8 meters and the width is 5 meters, what is the area of Hala's room? Lean and Whisper.

STUDENTS DO: Whisper answers.

2. TEACHER SAY: The area is 40 square meters. 8 × 5 = 40. But what if Hala's room looked like the next image in your book? It looks a bit like a rectangle with a chunk out of it, but not all of the dimensions are labeled. How could we figure out the missing measurements for that room? Turn to your Shoulder Partner and discuss how you would determine the missing measurements. Give me a Thumbs Up when you are ready to share what the missing measurements might be and how you found them.

STUDENTS DO: Share thinking with a **Shoulder Partner** about how they would find the missing measurements. Give a **Thumbs Up** to volunteer. Selected students explain strategies to the class.

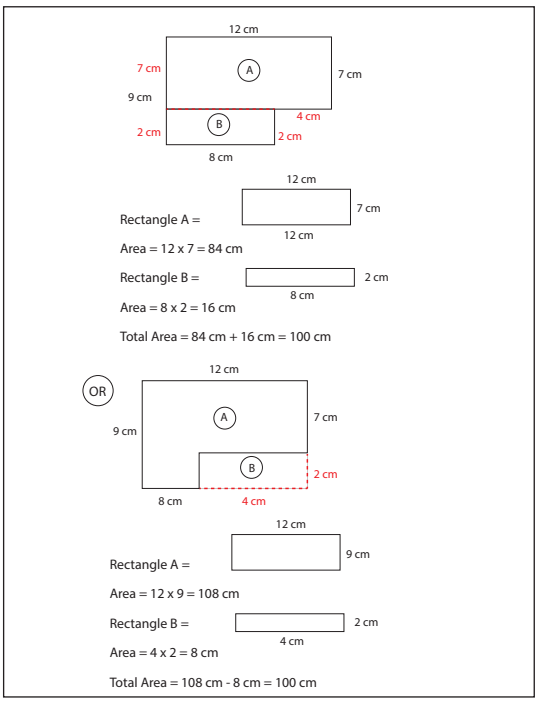
TEACHER DO: Draw an example on the board of the shape. Call on students to try strategies for finding the missing measurements.

Note to the Teacher: Some students may first add up all the sides and subtract that from 42 so they know that they need 6 cm. Others may use the information from the labeled sides 12 cm and 9 cm to find the difference for the sides labeled 8 cm and 7 cm. As students share, clarify any confusion by restating the explanations clearly.

TEACHER SAY: Good thinking. We can use the existing measurements and the total perimeter to help us. Just like with the first problem, knowing the length of one side of a square or a rectangle enables you to determine what the other side should measure even if a section is removed. Now that we know the missing measurements, raise your hand if you have an idea how we might find the area of this complex shape.

STUDENTS DO: Raise hand to volunteer. Selected students share thinking.

TEACHER DO: Ask several students to share thinking to ensure that the class hears different strategies. Students may divide this complex shape in a variety of ways to find the area of the two smaller shapes. Draw lines that show how the students are dividing up the shape into smaller shapes to determine the area. (You may need to draw more than one model so that students can see all of them at once.) For example:



3. TEACHER SAY: In both problems, information about the perimeter was given, and then we determined the area. The first problem was a basic rectangle, but the second problem was a more complex shape. However, we saw that we could divide the complex shape up into smaller rectangles to help us. Now it is your turn to try some. You may work with your Shoulder Partner since these are complex. That means they can be challenging. For each problem in the Partner Practice section, you will be given some information about shapes. Your task is to find the area of the shapes. If you finish early, you can work on the Challenge problem.

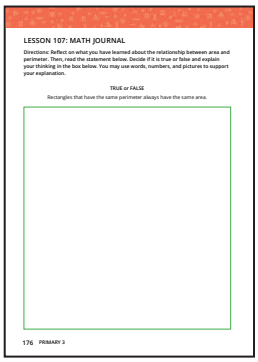
STUDENTS DO: Work with a **Shoulder Partner** to complete the area and perimeter problems in the student book. Students who finish early may try the Challenge problem.

TEACHER DO: Walk around the room, observing students as they work. Help students who are having trouble, and if necessary, pull a small group to work with. When Learn is over, bring the group back together.

TEACHER SAY: I appreciate the way you worked together to solve these problems. All of you continue to think like mathematicians and persevere through tough problems. (Point to Thinking Like a Mathematician chart.) Keep out your books for Reflect.

Reflect (5 to 10 minutes)

Directions


LESSON 107: MATH JOURNAL

Directions: Reflect on what you have learned about the relationship between area and perimeter. Then, read the statement below. Decide if it is true or false and explain your thinking in the box below. You may use words, numbers, and pictures to support your explanation.

TRUE or FALSE

Rectangles that have the same perimeter always have the same area.

176 PRIMARY 3

1. TEACHER SAY: Today we did some complex math with complex shapes. We figured out perimeter and area of quadrilaterals and different shapes. Turn to page Lesson 107: Math Journal in your student book and read the directions.

STUDENTS DO: Turn to the Math Journal page and read the directions silently.

TEACHER DO: Make sure students understand the directions before beginning to write. Collect the books to read students' responses. They will provide valuable information about students' current understanding of area and perimeter and the relationship between the two.

Lesson 108 Overview

LESSON OVERVIEW

In this lesson, students begin by solving a two-step story problem to review time. The problem challenges students to draw given times on a clock and to calculate what the clock will look like after a given amount of time has passed. For Learn, students continue to challenge their understanding of area and perimeter. In today's lesson, students determine the perimeter of a rectangle when they know its area and one dimension. For Reflect, they think about which is easier for them—finding the perimeter when given the area or finding the area when given the perimeter, and explain thinking using words, numbers, or pictures.

LEARNING OBJECTIVES

Students will:

- Draw hands on clocks to show given times.
- Solve story problems involving time.
- Determine the perimeter of a rectangle when given the area and one dimension.

LESSON PREPARATION FOR THE TEACHER

- Prior to the lesson, draw three clocks on the board with no hands (for Connect).
- Draw the rectangle on the board from the Group Practice in Apply.

KEY VOCABULARY

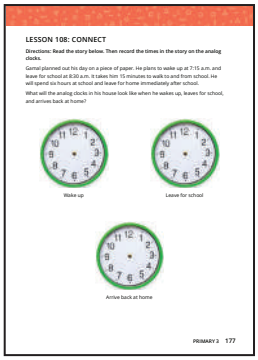
- Factor pairs
- Quotient
- Review previously taught vocabulary.

MATERIALS

- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 108: CONNECT

Directions: Read the story below. Then record the times in the story on the analog clocks.

Gamal planned out his day on a piece of paper. He plans to wake up at 7:15 a.m. and leave for school at 8:30 a.m. It takes him 15 minutes to walk to and from school. He will spend six hours at school and leave for home immediately after school.

What will the analog clocks in his house look like when he wakes up, leaves for school, and arrives back at home?

Wake up

Leave for school

Arrive back at home

PRIMARY 3 177

1. TEACHER DO: Have students open Mathematics Student Books to page Lesson 108: Connect and read the directions and the story problem to themselves. After making sure students understand the directions, have them begin working. When they finish, they should check work with a **Shoulder Partner**.

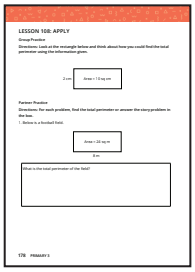
STUDENTS DO: Turn to the Connect page and read the directions. Work to solve the time review problem and check work with a partner.

TEACHER DO: After about 5 minutes, ask for students to share work with the larger group by drawing the hands on the three clocks on the board and explaining how they determined what time Gamal got home.

TEACHER SAY: Telling and writing time is a math skill and a life skill, so it is good to keep practicing and reviewing. Keep out your books for Learn.

Learn (35 to 45 minutes)

Directions


LESSON 108: APPLY

Group Practice

Directions: Look at the rectangle below and think about how you could find the total perimeter using the information given.

2 cm

Area = 10 sq cm

Partner Practice

Directions: For each problem, find the total perimeter or answer the story problem in complete sentences.

1. Below is a football field.

Area = 24 sq m

8 m

What is the total perimeter of the field?

178 PRIMARY 3

1. TEACHER SAY: In our last math class, we had to figure out the area when we knew something about the perimeter. Our learning target today is to think about how we can determine the perimeter if we know the area of a shape. Please open your Mathematics Student Book to page Lesson108: Apply.

STUDENTS DO: Open to page Lesson 108: Apply in the student book.

TEACHER SAY: Under Group Practice, there is a rectangle. One of the side measurements is given and the total area is also given. How would you determine the total perimeter using the information presented? Think quietly for a moment. Give me a Thumbs Up when you are ready

to share your thinking. You do not have to solve the problem just yet. I am only interested in your strategy for now.

STUDENTS DO: Think about how they would find the perimeter of a rectangle given the measurement of one side and the area. Give a **Thumbs Up** to volunteer. Selected students share ideas.

Note to the Teacher: Some students may understand that if they take the total area of 10 square cm and divide it by 2, then they have the length. This can be a tricky concept, requiring understanding of the factors of 10 as well as solving for an unknown. Going over it explicitly can help everyone. If all your students seem to understand, skip the direct instruction below.

TEACHER SAY: To find the area of a rectangle or square we know that we can multiply the length times the width. In this problem, we have the area and the width but not the length. We have an unknown factor that we need to solve for.

TEACHER DO: Write the following on the board:

Length × Width = Area
_____ × 2 cm = 10 square cm

TEACHER SAY: Thinking about it another way, we have the product, the area, and one of the factors, so we could write a division equation to help us find the length of the missing side.

TEACHER DO: Write the following on the board:

Area ÷ Width = Length
10 square cm ÷ 2 cm = _____

TEACHER SAY: What is the answer to both of these equations? Show me using your fingers.

STUDENTS DO: Hold up fingers to show answers.

TEACHER SAY: If you held up 5 fingers for 5 centimeters, you are correct. Now, Lean and Whisper what the total perimeter is in centimeters.

STUDENTS DO: Whisper answers.

TEACHER SAY: The perimeter of this rectangle is 14 centimeters. What other rectangle could we draw that has different side lengths, but still has the same area of 10 square centimeters? Raise your hand if you would like to come up and draw one.

STUDENTS DO: Raise hand to volunteer. Selected students draw other rectangles with an area of 10 square centimeters.

Note to the Teacher: Even though the 2 factors are the same, some students may see a rectangle with a width of 5 cm and a length of 2 cm as a different rectangle. Call on students until someone draws a 1 × 10 rectangle and/or a 10 × 1 rectangle.

2. TEACHER DO: Direct students' attention to the 1 × 10 or 10 × 1 rectangle and ask if the perimeter is still 14 centimeters.

STUDENTS DO: Calculate the perimeter of the new rectangle. Raise hand to volunteer. Selected students share findings.

TEACHER SAY: Why did the perimeter change even though the area stayed the same? Turn and Talk to your Shoulder Partner and share your thinking. Raise your hand when you are ready to share your thinking with the class.

STUDENTS DO: Share thinking with a partner about how the area of a rectangle can stay the same even when the perimeter changes. Raise hand to volunteer. Selected students share thinking with the class.

TEACHER DO: If necessary, clarify that the perimeter changes because there are multiple factor pairs of 10 (2 and 5, and 1 and 10) so those factor pairs can be used to draw different rectangles that will still have an area of 10 square centimeters.

3. TEACHER SAY: Now, it is your turn. In your student book, solve the problems under Partner Practice. You can work with a Shoulder Partner again today since these are challenging problems. Remember to think like a mathematician and persevere when things are hard. Use what you know to help you. If you have time, try to solve the riddles in the Challenge problem.

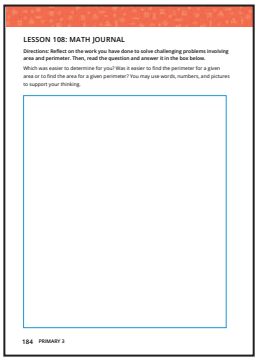
STUDENTS DO: Work with a partner to solve the area problems in the student books. Students who finish early may try the Challenge problem.

TEACHER DO: Walk around the room, observing students as they work. Help students who are struggling or group students into a small group to support those who may need it. Ask students to explain strategies for solving the problem.

TEACHER SAY: I love the way you work so hard to solve challenging problems. I also love how you help each other. You are becoming great mathematicians. Keep out your student book for Reflect.

Reflect (5 to 10 minutes)

Directions


LESSON 108: MATH JOURNAL

Directions: Reflect on the work you have done to solve challenging problems involving area and perimeter. Then, read the question and answer it in the box below.

Which was easier to determine for you? Was it easier to find the perimeter for a given area or to find the area for a given perimeter? You may use words, numbers, and pictures to support your thinking.

184 PRIMARY 3

1. TEACHER DO: Have students open student books to page Lesson 108: Math Journal and read the directions and prompt silently. Make sure students understand the directions and have them begin working on the journal prompt. Collect books to review each student's thinking and explanations.

TEACHER SAY: Great work today. In our next math lesson, we are going to put all these pieces together and do a project using area and perimeter to show our understanding.

Lesson 109 Overview

LESSON OVERVIEW

In this lesson, students are introduced to a final area and perimeter project. They begin by thinking about how to calculate the area and perimeter of an irregularly shaped room on a floor plan. This challenge involves thinking of a shape on a grid as a room seen from overhead, which will help students as they complete the project—the design of their dream house. Over the course of the next two lessons, students work on the project: planning rooms, calculating the area and perimeter of the rooms and of the whole house, and considering design constraints. The project challenges them to apply everything they have learned about area and perimeter in a real-world context.

LEARNING OBJECTIVES

Students will:

- Complete a house design project to demonstrate understanding of area and perimeter.

LESSON PREPARATION FOR THE TEACHER

Create a model of a "dream house" on grid paper. See Chapter Preparation for Lesson 109 for detailed instructions and an example.

KEY VOCABULARY

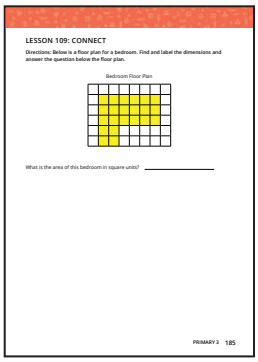
- Constraints
- Dimensions

MATERIALS

- Large grid paper (or large chart paper with a grid lightly drawn on it)
- Teacher-created dream house model
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 109: CONNECT

Directions: Below is a floor plan for a bedroom. Find and label the dimensions and answer the question below the floor plan.

Bedroom Floor Plan

What is the area of this bedroom in square units? _____

PRIMARY 3 185

1. TEACHER SAY: Please open your Mathematics Student Books to page Lesson 109: Connect.

STUDENTS DO: Turn to the Connect page in the student book.

TEACHER SAY: On this page you will see the outline of a bedroom from a house. It is a bird's-eye view, which means it is looking down at the outline of the rooms. If we wanted to determine the area of this bedroom, how could we do that? What information would we need? Think quietly for a moment and give me a Thumbs Up when you are ready to share.

STUDENTS DO: Think about strategies for finding the area of the irregular shape. Give a **Thumbs Up** to volunteer. Selected students share strategies and thinking with the class.

TEACHER SAY: To find the area of the room we need the dimensions. Since this room is drawn on unit grid paper, we can find the dimensions. With your Shoulder Partner, determine the dimensions using the grid. Label each side. Then, determine the area of this room in square units. Give me a Thumbs Up when you are finished.

STUDENTS DO: Using the grid, label each dimension and then find the area. Give a **Thumbs Up** when they are done.

2. TEACHER DO: While students are working, draw a copy of the room from the Connect problem on the large grid you prepared. When most students have a **Thumbs Up**, call on a student to come to the front and record the dimensions and the area. Allow them to ask for help from a friend if needed.

STUDENTS DO: Selected student shows work on the board and explains the strategy used. If necessary, the student may ask a friend for help.

TEACHER SAY: Good work. Since our shape is not a rectangle, we cannot find the area by multiplying the length times the width, but we can find the area by counting the square units or by breaking it into smaller quadrilaterals as we did before. What if we wanted to know the

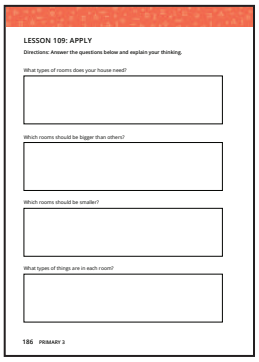
perimeter of this room? Think for a minute and then turn and tell your Shoulder Partner the perimeter of this room.

STUDENTS DO: Determine the perimeter and share answers with a **Shoulder Partner**.

TEACHER SAY: The perimeter of this room is 22 units. We are going to continue to explore the idea of a floor plan. Keep out your student book.

Learn (35 to 45 minutes)

Directions


LESSON 109: APPLY

Directions: Answer the questions below and explain your thinking.

What types of rooms does your house need?

Which rooms should be bigger than others?

Which rooms should be smaller?

What types of things are in each room?

186 PRIMARY 3

1. TEACHER SAY: Today we will begin a project where you can share all that you have learned about area and perimeter over the course of the year. It is an exciting project. Today you will use what you know about perimeter and area to design your dream house. Please turn in your student book to page Lesson 109: Apply and read and think about the list of questions. Do not write anything yet.

STUDENTS DO: Turn to the Apply page and read the questions silently.

TEACHER DO: After a couple minutes, have students **Brainstorm** answers to the questions on the Apply page with a partner.

STUDENTS DO: Brainstorm with a partner about potential dream houses.

TEACHER DO: Give students 2 to 3 minutes to talk about ideas and then ask several students to share ideas with the class. Students should be able to think about what rooms are needed inside a home, but should also be challenged to be creative in order to truly make it a dream home.

TEACHER SAY: Now, write your answers and ideas in your student book. Make sure you explain your thinking in words.

STUDENTS DO: Work independently to answer questions in order to plan a dream house.

TEACHER DO: Give students 10 to 15 minutes to work.

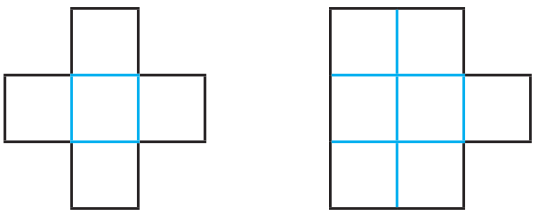
2. TEACHER SAY: On the next page, you will see a sheet of unit square paper. This paper is for your rough draft. You will sketch your rooms on this paper. Do you think the rooms in your house should connect? Raise your hand to share your thinking.

STUDENTS DO: Raise hands to volunteer. Selected students share thinking with the class.

Note to the Teacher: Most of the rooms need to connect in some way, but students might have a reason for having some rooms not connected. Accept all reasonable answers.

TEACHER SAY: What if I draw a room shaped like this?

TEACHER DO: Draw the following shapes on the large grid paper:



TEACHER SAY: The shape on the left could be a garden in my house and the shape on the right might be my garage. Can we still find the area and perimeter of these rooms? How? Raise your hand to share your thinking.

STUDENTS DO: Raise hands to volunteer. Selected students share ideas with the class.

TEACHER DO: If necessary, explain that even though the shapes are not quadrilaterals, we can still find the areas and perimeters by counting unit squares.

3. TEACHER SAY: Challenge yourselves to create two rooms in your house that are not quadrilaterals. Take a look at the grid in your student book. When we design something, whether it is a house or art or clothes, we have to consider design constraints. A CONSTRAINT is a restriction or limitation. It says what we can and cannot do. What are some possible constraints of this project? In other words, what may limit you as you design your dream house?

Note to the Teacher: It is not necessary for students to identify all of the constraints they may face, but design constraints are an important idea for them to consider. Although they may want to design an enormous house, they are constrained by the size of the grid. They may also have to adjust the size of some rooms to accommodate a desire for another room to be larger. Some students may note that the project only allows them to design a one-story house (though some students may try to fit two small stories onto the page). If no students mention the height constraint, consider mentioning it as a constraint you faced as you share your model with them. Allow students to share ideas, but do not spend more than a few minutes on this discussion.

4. TEACHER SAY: Before you begin, I would like to show you my dream house. It is not finished yet because I have not labeled the area and perimeter of each room, but I did write the name of each room. Remember, this is my dream home and yours may, and should be, different. Please take a moment to look at it and see if you have any questions.

STUDENTS DO: Look at the teacher model and ask any lingering questions.

TEACHER DO: Answer students' questions and make sure they understand the directions for creating a rough draft of the dream house. Explain that they will have a chance during the next math lesson to create a final draft and draw in any furniture, rugs, or appliances they may want to add. Have students begin working.

STUDENTS DO: Create a rough draft design of dream houses in the student book.

TEACHER DO: Walk around the classroom and monitor students as they work. Make sure that students are following all of the directions. If students are struggling, call either the whole class or a small group together and have them help you figure out the area and perimeter for the rooms in your model. At the end of Learn, use an **Attention Getting Signal**.

TEACHER SAY: I saw some very interesting designs and exciting dream houses. Please put your books away for Reflect.

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: Let's reflect on what we learned and did today in class. Turn to your Shoulder Partner now to share what you did, how you did it, and any challenges you faced. What kinds of rooms did you include in your house? Compare your ideas and strategies to see what you notice. I will use Calling Sticks to have some of you share out in a few minutes.

STUDENTS DO: Share designs and design strategies with a **Shoulder Partner**. Compare ideas and design approaches as well as strategies for finding the perimeter and area of each room.

TEACHER DO: Use **Calling Sticks** to select students to share out. Encourage students to ask questions of each other.

STUDENTS DO: Selected students share ideas and observations and ask each other questions about their work.

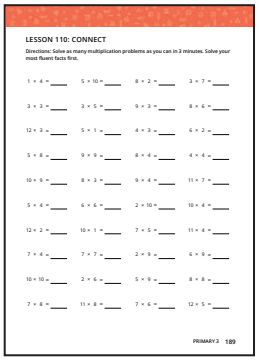
TEACHER SAY: You did a great job today beginning your projects on area and perimeter. You will get to work on them more in our next math class.

Lesson 110 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
Students begin this lesson with fluency math fact practice. They then continue to work on the dream house project. If an additional math period is needed for them to complete the work, consider allowing them to do so. The rough draft and final project can be used as an area and perimeter final assessment.	Students will: • Complete a house design project to demonstrate understanding of area and perimeter.	Review vocabulary as needed.
	LESSON PREPARATION FOR THE TEACHER	**MATERIALS**
	No additional preparation needed.	• Crayons or colored pencils • Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 110: CONNECT

Directions: Solve as many multiplication problems as you can in 3 minutes. Solve your most fluent facts first.

PRIMARY 3 189

1. TEACHER SAY: Please open your Mathematics Student Books and turn to page Lesson 110: Connect.

STUDENTS DO: Open student books to the Connect page.

TEACHER SAY: When I say start, you will have 3 minutes to solve as many problems as you can. Remember to solve your most fluent facts first. When you hear me say stop, put your pencils down immediately.

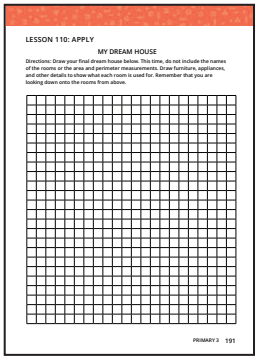
TEACHER DO: When students are ready, say start. After 3 minutes, say stop.

STUDENTS DO: Work on the problems until time is called.

TEACHER DO: Go over the answers together. Have students circle the math facts they will work on next to build fluency.

Learn (35 to 45 minutes)

Directions


LESSON 110: APPLY

MY DREAM HOUSE

Directions: Draw your final dream house below. This time, do not include the names of the rooms or the area and perimeter measurements. Draw furniture, appliances, and other details to show what each room is used for. Remember that you are looking down onto the rooms from above.

PRIMARY 3 191

1. TEACHER SAY: Today you will continue working on your dream house floor plans. In our last math class, you sketched out and labeled all the rooms. If you did not finish doing that, you can finish today, but you should work quickly. You should also find the area and the perimeter for each room and record that information on your rough draft sketch. Please open to Lesson 110: Apply and read the directions to yourself.

STUDENTS DO: Turn to the Apply page and read the directions silently.

TEACHER SAY: For the rest of the Learn period, you will work on the final design of your house. The final design should look like your rough draft, but you will not write the names or dimensions of the rooms on your final design. Instead, you will draw all the things you would like to put into each room.

Make sure your drawing is detailed enough so that someone can tell what each room is used for. For example, in my kitchen, I may draw a sink and a refrigerator. I have to draw it as though I am on the ceiling looking down, so I have to use my imagination.

Sketch your work in pencil first and then you can use crayons or colored pencils to color. Please begin. I will be walking around if you need assistance.

STUDENTS DO: Work on final draft dream house designs.

TEACHER DO: Walk around and offer assistance to students as they work. At the end of Learn, use an **Attention Getting Signal**.

TEACHER SAY: Please keep your student books open to your final house design page for Reflect.

Reflect (5 to 10 minutes)

Directions

1. **TEACHER SAY: For Reflect we are going to do a Gallery Walk to see each other's work. When I clap once, being walking quietly around the room. Look at each other's work and think of questions or compliments you have for your friends. When you hear two claps, stop and freeze. We will then give compliments to each other and ask questions.**

TEACHER DO: Clap once to signal the start of the **Gallery Walk**. Give students 2 to 3 minutes to walk around looking at other's work. Clap twice and then call on students to share compliments and ask questions. Repeat as time permits.

STUDENTS DO: Walk around the room looking at other students' work. Stop and share questions or compliments when two claps are heard.

TEACHER SAY: You all did wonderful work today. Creating floor plans and finding area and perimeter is just one more way people use math in the real world.

TEACHER DO: Collect students' books to check perimeter and area calculations on the rough draft design page. This project can be used as a final assessment for area and perimeter.

PRIMARY 3

Mathematics

COMMUNICATION

CONNECTIONS

Chapter 6

Lessons 111 to 120

Chapter 6 : Lessons 111 to 120

In the final chapter of Primary 3, students review and extend their understanding of the supporting work of the grade. Most Connect segments ask students to build fluency in the basic math facts in all operations. During Learn segments throughout this chapter, students deepen their understanding of fractions, place value, and graphing. In most Reflect segments, students produce game cards to review their learning in mathematics throughout Primary 3. Students will use these cards to make a review game, which they will play with a partner in Lesson 119.

COMPONENT	DESCRIPTION	LESSONS
 Connect	During this daily routine, students build fluency in previously learned skills, make connections between prior learning and the upcoming Learn segment, and discuss mathematics concepts. Students may be introduced to an engaging, real-world math problem that establishes a purpose for learning a new skill or concept.	10 to 15 minutes
 Learn	During this daily routine, students learn and apply various math skills and concepts. Students engage in exploration, experimentation, problem-solving, collaboration, and discussion to build understanding and application of new skills and concepts and make connections to prior learning. Students learn to think and work like mathematicians and persevere in developing foundational understanding of challenging skills and concepts.	35 to 45 minutes
 Reflect	During this daily routine, students develop the ability to express mathematical ideas by talking about discoveries, using math vocabulary, asking questions to make sense of learning tasks, clarifying misconceptions, and learning to see things from peers' perspectives.	5 to 10 minutes

Learning Indicators

Throughout Lessons 111 to 120, students will work toward the following learning indicators:

B. OPERATIONS AND ALGEBRAIC THINKING:

1.c. Multiply and divide within 100.

1.e. Know from memory all products of two 1-digit numbers by the end of Primary 3.

C. NUMBERS AND OPERATIONS IN BASE TEN:

1.a. Read and write numbers to 100,000 using numerals and expanded form.

3.c. Identify and represent fractions on a number line.

3.i. Compare two fractions with the same numerator or the same denominator by reasoning about their size using a number line or concrete models.

D. MEASUREMENT AND DATA:

3.a. Tell and write exact time from analog and digital clocks.

4.b. Solve story problems and analyze data displayed on a line plot.

G. GEOMETRY:

1.b. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole.

CH 6 Pacing Guide

LESSON	INSTRUCTIONAL FOCUS
111	Students will: • Color shapes to generate unconventional halves.
112	Students will: • Apply understanding of area and fractions to solve story problems.
113	Students will: • Order fractions on a number line. • Generate questions or problems to review Primary 3 math.
114	Students will: • Solve place value problems. • Generate questions or problems to review Primary 3 math.
115	Students will: • Solve elapsed-time problems. • Generate questions or problems to review Primary 3 math.
116	Students will: • Measure objects to the nearest half centimeter. • Use measurement data to make line plots. • Analyze line plots to answer questions about the data. • Generate questions or problems to review Primary 3 math.
117	Students will: • Collect and record data in a table. • Use collected data to make a line plot. • Use collected data to make a bar graph. • Analyze graphs to answer questions about data. • Compare the effectiveness of line plots and bar graphs to display data. • Generate questions or problems to review Primary 3 math.
118	Students will: • Draw quadrilaterals and non-quadrilaterals on grid paper to produce a game board. • Find the area and perimeter of each shape on a game board. • Generate questions or problems to review Primary 3 math.
119	Students will: • Review mathematics skills and concepts from Primary 3. • Identify what went well with the game and what they would improve.
120	Students will: • Produce a personal plan for summer learning. • Reflect on growth and development as mathematicians in Primary 3.

Chapter Preparation for Teacher

For Lesson 111:

- Make sets of two circles (one set per student and one teacher set) or print and cut out the Circle Template Blackline Master.

For Lesson 113:

- Gather note cards or cut rectangular pieces of paper (about 8 cm × 10 cm). Each student will need three cards for this lesson.
  - Each student will need a total of 18 cards through Lesson 118.
- Gather plastic baggies or paper bags for students to store Primary 3 review game cards. Each student will need one bag.

For Lesson 114:

- Gather dice (two per pair of students).
- Gather or make three note cards per student.
- Prior to the lesson, draw the following on the board:

Ten Thousands	Thousands	,	Hundreds	Tens	Ones
		,			

For Lesson 115:

- In this lesson, the teacher chooses a review game for Connect. Gather any materials needed based on the game selected.
- Gather or make three note cards per student.
- Obtain or produce an analog teaching clock with movable hands. If no clock is available, use the Analog Clock Face—Large Blackline Master.

For Lesson 116:

- Prior to the lesson, divide the class into groups of four or five students and post the groups on the board. Think about students who work well together and how to support those who might need more help.
- Gather centimeter rulers (one per student).
- Prepare bags of 12 straws (or sticks or pieces of string). You will need one bag per small group of students for a measurement activity.
  - The items should range in size from 2 cm to 18 cm.
  - A few of the items should be the exact same length and some should measure to the $\frac{1}{2}$ centimeter. For example:
    - 3 straws measuring 6 cm
    - 2 straws measuring 12 cm
    - 2 straws measuring $4\frac{1}{2}$ cm
    - 1 straw measuring 2 cm
    - 1 straw measuring 10 cm
    - 1 straw measuring $10\frac{1}{2}$ cm
    - 1 straw measuring $16\frac{1}{2}$ cm
    - 1 straw measuring 18 cm
  - Gather or make three note cards per student.

For Lesson 117:

- Gather six-sided dice (one die per pair of students).
- Gather or make three note cards per student.

For Lesson 118:

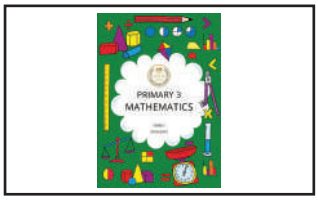
- In this lesson, the teacher chooses a review game for Connect. Gather any materials needed based on the game selected.
- Gather or make three note cards per student.
- Print one-centimeter grid paper using the 1-Centimeter Grid Blackline Master. You will need at least one sheet per student.

For Lesson 119:

Gather items students can use as game pieces. Each student will need a game piece that is different from their partner's game piece.

Materials Used

Student book



Pencil

Colored pencils or crayons

Note cards

Plastic baggies or paper bags (one per student)

Dice

Bags of 12 straws, sticks, or pieces of string (one bag per small group of students)

Analog teaching clock

Sets of two circles (one set per student plus one set for the teacher)

Thinking Like a Mathematician anchor chart

Teacher and student fraction strip models

Materials for Connect game

1-centimeter grid paper (one sheet per student)

Game boards produced by students

Game pieces (one per student)

Lesson 111 Overview

LESSON OVERVIEW

In this lesson, students begin by reviewing fact families by solving problems with one unknown. Then, they analyze and generate unconventional halves. This extends understanding about fraction models past simple geometric shapes and demonstrates that halves can look different in the real world. In Reflect, students participate in a **Gallery Walk** to share generated examples of unconventional halves.

LEARNING OBJECTIVES

Students will:

- Color shapes to generate unconventional halves.

LESSON PREPARATION FOR THE TEACHER

- Make sets of two circles (one set per student and one teacher set) or print and cut out the Circle Template Blackline Master.

KEY VOCABULARY

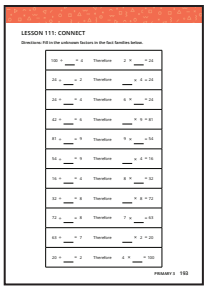
- Unconventional

MATERIALS

- Sets of two circles (one set per student plus one set for the teacher)
- Teacher fraction strip models
- Crayons (one per student)
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 111: CONNECT

Directions: Fill in the unknown factors in the fact families below.

PRIMARY 3 193

1. TEACHER DO: Have students open Mathematics Student Books to page Lesson 111: Connect and read the directions. Make sure students understand the directions and then have them begin working independently to complete the math fact review.

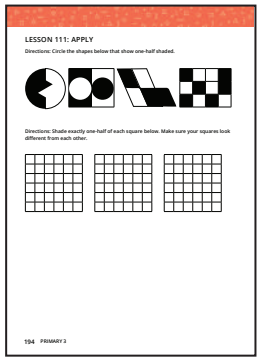
STUDENTS DO: Turn to the Connect page and complete the fact family practice activity.

TEACHER DO: At the end of Connect, go over the answers with students. Allow them to make corrections, if necessary.

TEACHER SAY: **Nice job warming up your brain for today's work.**

Learn (35 to 45 minutes)

Directions


LESSON 111: APPLY

Directions: Circle the shapes below that show one-half shaded.

Directions: Shade exactly one-half of each square below. Make sure your squares look different from each other.

194 PRIMARY 3

1. TEACHER SAY: **Open your student book to page Lesson 111: Apply and look at the four images on the page. Which shapes show one-half shaded? Circle them and then raise your hand to share your thinking.**

STUDENTS DO: Turn to the Apply page, circle the shapes that show one-half shaded, and raise hand to share thinking. Selected students share thinking.

TEACHER SAY: **How do you know if the shapes are partitioned evenly into halves?**

TEACHER DO: Use **Calling Sticks** to select students to share thinking. Accept all reasonable answers.

Note to the Teacher: Students should see that each correct shape (shapes 1, 2, and 4) has the same amount of shaded and unshaded space. Answers may include:

- *I counted the number of squares and then looked to see if half of them were shaded.*
- *It looks like they cut the circle out of both sides and then just put them on the rectangles.*

- *There is an extra piece so I know it is not a true half.*
- *If I fold the circle in half, equal amounts will be shaded.*

TEACHER SAY: Our goal for today is to understand unconventional halves. These images are unconventional halves.

TEACHER DO: Pick up the two halves from your large set of fraction strip models and hold them so all students can see them.

TEACHER SAY: Remember the halves in our fractions models? How are these images of unconventional halves different and similar to these halves? Turn and Talk to your Shoulder Partner.

STUDENTS DO: Share thinking with partners.

TEACHER DO: Give students 2 to 3 minutes to discuss the answers and then use **Calling Sticks** to choose students to share thinking with the class. Answers may include:

- The fraction strip halves are exactly the same shape; they are both rectangles of exactly the same size. The unconventional halves are arranged differently.
- Both sets of halves—the fraction strips and the images—show equal amounts in each half.

2. TEACHER SAY: Today you are going to generate your own unconventional halves. You must make sure that you shade exactly one half of your shape. Please look in your student book and count how many unit squares are in each grid. Whisper it when you are ready.

STUDENTS DO: Whisper answers.

TEACHER SAY: You will need to shade exactly half of 36. What is half of 36? Raise your hand when you know.

STUDENTS DO: Determine half of 36. Raise hand to volunteer. Selected students share answers and explain strategies.

TEACHER SAY: You will use your crayon to shade exactly 18 squares. See if you can color your halves differently in each one. You will have about 5 minutes to work.

TEACHER DO: Hand out crayons to students (or have them take them out). Each student needs one crayon.

STUDENTS DO: Work in student books to shade half of three different squares in three different ways.

TEACHER DO: Monitor students as they work. Make sure they are able to explain how they know each square is divided into halves and that each square is shaded differently. After 5 to 8 minutes, use an **Attention Getting Signal**.

3. TEACHER SAY: We are now going to look at halves in a different way—with circles. I will give each of you two circles. These circles do not have grids, but they do have a mark to show the midpoint. Think for a moment about how you might divide one of these circles into halves. Raise your hand when you have an idea.

STUDENTS DO: Think quietly for a moment. Raise hands to volunteer. Selected students share ideas.

Note to the Teacher: If students are uncertain, tell them they can fold the circle in half to make 2 halves using the dot in the middle as a guide. Caution students to make the folds as accurate as possible.

TEACHER DO: Model how to fold the half in half again to make fourths.

TEACHER SAY: How might it help us to know where fourths are when making halves? Raise your hand if you have an idea.

STUDENTS DO: Share ideas.

TEACHER DO: Have students fold circles one more time, open them up, and ask them what fractions it now shows (eighths).

TEACHER SAY: **Now, you will shade both of your circles to show creative halves, just as you did with your squares. What questions do you have?**

STUDENTS DO: Ask clarifying questions if needed. Work independently to generate representations of halves using circles.

TEACHER DO: Walk around and monitor students as they work. Offer support to students as needed.

TEACHER SAY: **You did a great job today working with unconventional halves. Please put your student books and crayons away and prepare for Reflect.**

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: **Today our goal was to understand unconventional halves. Make sure your book is open to the Apply page and that your colored circles are on your desk as well. For Reflect, we are going to do a Gallery Walk to see each other's hard work and make sure that you were able to show one half in your squares and circles. When you hear one clap, walk quietly around the room and look at each other's work. When you hear two claps, stop and freeze. We will then give compliments to each other and ask questions.**

STUDENTS DO: Display the work they completed today. Participate in the **Gallery Walk**.

TEACHER DO: Clap to signal the start of the **Gallery Walk**. Give students 2 to 3 minutes to walk around, looking at each other's work. Clap twice and then call on students to share compliments and ask questions. Repeat as time permits.

TEACHER SAY: **You all did wonderful work today learning about different ways to represent halves.**

Lesson 112 Overview

LESSON OVERVIEW	LEARNING OBJECTIVES	KEY VOCABULARY
In this lesson, students revisit the Thinking Like a Mathematician anchor chart and consider a new practice: using what they know about math to solve challenging problems. This reminds students that everything they have learned in mathematics is important and can be used to help them learn new skills and concepts. Students work together and independently to solve complex problems and reflect on the experience at the end of the lesson.	Students will: • Apply understanding of area and fractions to solve story problems.	Review previous vocabulary as needed.

LESSON PREPARATION FOR THE TEACHER

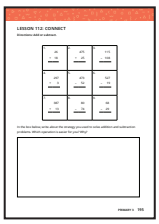
- Display Thinking Like a Mathematician anchor chart.

MATERIALS

- Thinking Like a Mathematician anchor chart
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 112: CONNECT

1. TEACHER DO: Have students open Mathematics Student Books to page Lesson 112: Connect and read the directions. Make sure students understand the directions and have them begin working.

STUDENTS DO: Turn to the Connect page and work independently to complete the addition and subtraction review problems.

TEACHER DO: At the end of Connect, use an **Attention Getting Signal** and go over the answers. Ask a few students to share reflections about addition and subtraction strategies.

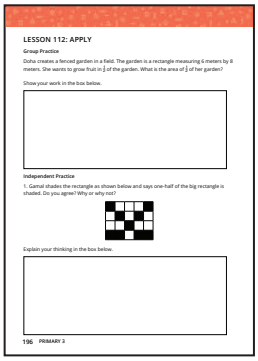
Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today we are going to work on another practice that good mathematicians use: to look for and make use of structure.

TEACHER DO: Point to Thinking Like a Mathematician anchor chart and review the practices that are already listed. Add the following to the chart:

Mathematicians use what they know about math to solve challenging problems.


LESSON 112: APPLY

Group Practice

Independent Practice

196 PRIMARY 3

TEACHER SAY: When we look for and make use of structure, it means we use what we already know about math to solve problems. Your goal for today will be to use what you already know about area and fractions to solve story problems. Please open your books to page Lesson 112: Apply and let's try the Group Practice problem together. Read the problem to yourself. After you read the problem, talk to your Shoulder Partner about how you might solve it.

STUDENTS DO: Turn to the Apply page and read the problem silently. Talk to partners about problem-solving strategies.

TEACHER DO: Give students time to share thinking with each other. Call on students to share thinking and walk through the steps of the problem together while writing and drawing on the board. If students cannot come up with the steps themselves, ask questions such as the following to help them figure out how to solve the problem:

- What does the garden look like? How do you know? How can we show that? (Draw the garden and label the sides.)
- Can we draw a line to split the rectangle in half? How? (vertically, horizontally, or diagonally)
- What is the area of the garden? How can we figure out what half of the area is?

Note to the Teacher: There are several strategies for solving this problem. Allow students to share ideas as long as they can explain their thinking. If time permits, ask students to share other ways to solve the problem.

2. TEACHER SAY: Today you will practice solving these types of problems independently in your student book. Remember, as our Thinking Like a Mathematician chart states, we can use what we already know to help us solve challenging problems. Please work on your own to solve the Independent Practice problems in your student book. I will be around to offer help if you need it.

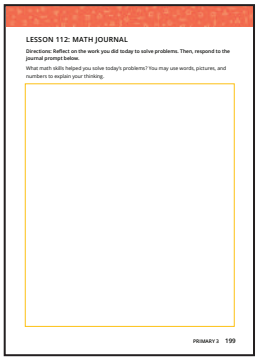
STUDENTS DO: Work independently to solve the story problems, showing work. Ask for help if needed.

TEACHER DO: Walk around the room and monitor students as they work. Some of these problems are more challenging than others. Note the types of problems students are struggling with. At the end of Learn, go over the problems and solutions as a class. Students may use different problem-solving strategies. Allow all reasonable answers, but encourage students to explain their thinking using what they know about math.

TEACHER SAY: You did great work applying your understanding of fractions and area to solve real-world math problems. Please keep out your student book for Reflect.

Reflect (5 to 10 minutes)

Directions


LESSON 112: MATH JOURNAL

Directions: Reflect on the work you did today to solve problems. Then, respond to the journal prompt below.

What math skills helped you solve today's problems? You may use words, pictures, and numbers to explain your thinking.

PRIMARY 2 199

1. TEACHER SAY: Today you worked on a new mathematical practice: looking for and making use of structure. Remember that this means you are able to use what you already know about math to solve challenging math problems. For today's Reflect, you will explain the skills and knowledge you have as a mathematician that helped you with your work today. You may use words, pictures, and numbers to explain your thinking. Please turn to page Lesson 112: Math Journal and begin.

STUDENTS DO: Turn to the Math Journal page and respond to the prompt.

TEACHER DO: Collect students' books and read journal responses to learn how well they are able to use what they know about math to solve problems.

Lesson 113 Overview

LESSON OVERVIEW

In this lesson, students begin with some fluency work by practicing multiplication and division facts for 6. In Learn, students return to fractions, combining the skills of ordering on a number line and identifying equivalent fractions. Students are challenged to place fractions with different denominators on the same number line. Some students may need to work with a partner, while others will need additional instructional support from the teacher. In Reflect, students begin making cards for a game they will design in Lesson 118 that allows them to review and practice the mathematics content they have learned in Primary 3. Students will spend part of the next six lessons creating cards as they will cover a variety of content.

LEARNING OBJECTIVES

Students will:

- Order fractions on a number line.
- Generate questions or problems to review Primary 3 math.

LESSON PREPARATION FOR THE TEACHER

- Prior to the lesson, draw the number line from Lesson 113: Apply, Group Practice, on the board.
- Gather note cards or cut rectangular pieces of paper (about 8 cm × 10 cm). Each student will need three cards. (Each student will need 18 cards through Lesson 118.)
- Gather plastic baggies or paper bags for students to store Primary 3 review game cards. Each student will need one bag.

KEY VOCABULARY

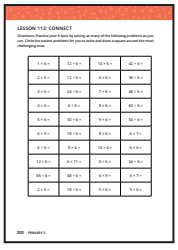
- Equivalence
- Denominator
- Interval
- Number line
- Numerator

MATERIALS

- Note cards (three per student)
- Plastic baggies or paper bags (one per student)
- Optional: Student fraction strip models
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 113: CONNECT

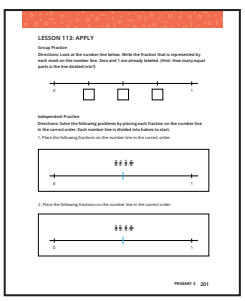
1. TEACHER DO: Have students open Mathematics Student Books to page Lesson 113: Connect and read the directions. Make sure students understand the directions and have them begin working.

STUDENTS DO: Turn to the Connect page and work independently to complete the multiplication and division fact review problems.

TEACHER DO: Use an **Attention Getting Signal** and go over the answers. Ask a few students to share reflections about which problems are still challenging for them. Encourage students to share helpful strategies with each other.

Learn (35 to 45 minutes)

Directions


LESSON 113: APPLY

Group Practice

Independent Practice

1. TEACHER SAY: Today our goal is to order fractions on a number line. Please open your student book to page Lesson 113: Apply and read the directions under Group Practice.

STUDENTS DO: Turn to the Apply page and silently read the Group Practice directions.

TEACHER SAY: Label each of the marks with the fraction that represents that interval. Give me a Thumbs Up when you are done.

STUDENTS DO: Work independently to label $\frac{1}{4}$, $\frac{2}{4}$, and $\frac{3}{4}$ on the Group Practice number line. When finished, give a **Thumbs Up**.

TEACHER DO: After most students are finished, ask a volunteer to come to the front and show how they labeled the number line with the fractions. Have the student explain how they knew what to label the marks. Ask students to identify fractions that represent 0 and 1.

TEACHER SAY: This line has four equal parts, so each segment represents $\frac{1}{4}$ of the total line. However, what if we wanted to put the fraction $\frac{1}{2}$ on the number line? Where would that fraction go? Share your thinking with your Shoulder Partner. Raise your hand when you know.

STUDENTS DO: Discuss with a partner where they think $\frac{1}{2}$ should go on the number line. Selected student shares answer and labels $\frac{1}{2}$ on the number line on the board. Seated students record the answer in the book.

2. TEACHER SAY: $\frac{1}{2}$ and $\frac{2}{4}$ are equivalent fractions. Raise your hand if you can remind us what equivalent fractions are.

STUDENTS DO: Share a definition of equivalent fractions.

TEACHER SAY: Who knows another fraction that is equivalent to $\frac{1}{2}$?

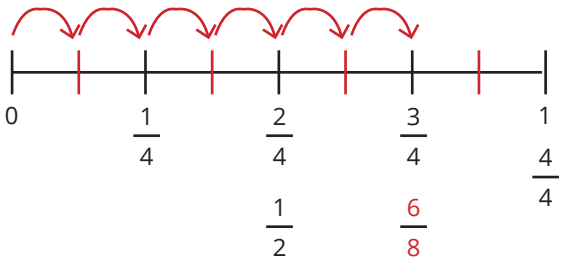
TEACHER DO: Call on students to share answers. Students may remember from fraction strip models that $\frac{3}{6}$, $\frac{4}{8}$, and $\frac{6}{12}$ are equivalent to $\frac{1}{2}$.

3. TEACHER SAY: What if I wanted to place the fraction $\frac{6}{8}$ on the number line? How could I determine where that fraction would go? Share your ideas with your Shoulder Partner and give me a Thumbs Up when you are ready to share.

STUDENTS DO: Talk about possible strategies with a partner. Give a **Thumbs Up** to volunteer. Selected students share answers and explanations. Volunteer labels $\frac{6}{8}$ on the number line on the board. Seated students record the answer.

TEACHER DO: If necessary, clarify that because the denominator is now 8 the line needs to be divided into 8 equal parts, or intervals. Draw new marks halfway between each quarter mark to divide the line into 8 segments. **Model** how to count to $\frac{6}{8}$. Ensure that students label the number line and see that $\frac{6}{8}$ is equivalent to $\frac{3}{4}$.

Example:

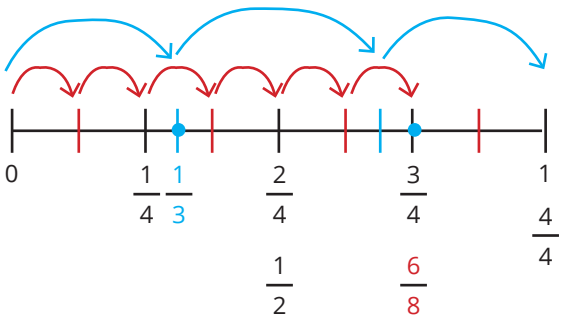


4. TEACHER SAY: Remember, the denominator tells us how many equal parts the whole is divided into, and now we can see that $\frac{3}{4}$ and $\frac{6}{8}$ are equivalent fractions. They are on the same spot on the number line. For this last one, I am going to challenge you to really use your brains. What if we wanted to put $\frac{1}{3}$ on this same number line? Share your thinking with your partner. About where would you place $\frac{1}{3}$? How would you figure it out? Show your thinking in your student book.

STUDENTS DO: Discuss with partner where they would put $\frac{1}{3}$ on the number line. Explain strategy to each other.

TEACHER DO: After 1 to 2 minutes, ask for a student to show on your number line approximately where they would place $\frac{1}{3}$. Ask the student to explain how they determined where to place $\frac{1}{3}$. Some students may have divided the number line into 3 equal pieces, ignoring the $\frac{1}{4}$ and $\frac{1}{8}$ marks. Other students may remember that $\frac{1}{3}$ is between $\frac{1}{2}$ and $\frac{1}{4}$.

Example:



TEACHER SAY: Great. Thirds means the line has three equal parts, and $\frac{1}{3}$ is one of those parts. Now, we can easily see that $\frac{1}{3}$ is larger than $\frac{1}{4}$ and smaller than $\frac{1}{2}$. Ordering fractions on the line helps us to see which fractions are larger and closer to 1, and which fractions are smaller, or closer to 0.

TEACHER DO: Encourage students to ask questions or share other strategies (as long as they can explain their thinking). Clarify misconceptions and confirm accurate thinking.

5. TEACHER SAY: Now, it is your turn. In the Independent Practice section, you will work to label and order a set of fractions on a number line. Each number line will initially be divided into halves, since $\frac{1}{2}$ is a benchmark fraction. Continue to divide the line so that the fractions are in the appropriate location and ordered correctly. If two fractions are equivalent, then both can be written in the same spot, one above the other, just as we did in the Group Practice problem. When you are finished, you may try the Challenge problem. What questions do you have?

STUDENTS DO: Ask any clarifying questions and then begin to work independently to order fractions on the number line. Students who finish early may work on the Challenge problem.

TEACHER DO: Walk around the class, observing students as they solve problems. If many students are struggling, consider having them work with a partner and/or use fraction strip models. Help students who are struggling and bring them into a smaller group to work with you, modeling a few problems. When there are 5 minutes left in Learn, use an **Attention Getting Signal**.

TEACHER SAY: For the last 5 minutes of Learn, share your work with your Shoulder Partner, checking to see if you both ordered the fractions the same way. If you disagree, discuss why and work to find the correct answer together.

Note to the Teacher: If students worked with a partner to complete the activity, either have students share work with a different partner or go over the answers together as a class. Collect students' books to check answers.

TEACHER DO: Let this time be student led as they share thinking with each other, self-correct any errors, and if necessary, ask each other for support and clarification.

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: For today's Reflect, and over the next several lessons, you will make cards for a game that will help you review skills you learned in Primary 3 math. Each card will have a question or problem on the front and the answer on the back. Today you will make one card for fractions on a number line, one card for addition problems, and one card for subtraction problems.

Think for a moment about a question or a problem you could write about ordering fractions on a number line. Remember, you also have to know the answer. Give me a Thumbs Up when you have an idea.

STUDENTS DO: Think quietly about a possible question or problem and answer they could write as a Primary 3 review. Give a **Thumbs Up** when they are ready to share.

TEACHER DO: Call on several students to share thinking and model a question on the board. Possible examples include:

- Question: What are some helpful strategies for ordering fractions on a number line?
- Problem: Order the following fractions on a number line: $\frac{1}{2}$, $\frac{2}{3}$, $\frac{4}{8}$, and $\frac{3}{3}$.
- Problem: Show a number line with fractions ordered and ask if they are in the right location.
- Problem: Show a number line with some fractions labeled and some fractions missing. Ask to find the missing fraction(s).
- Problem: Add a fraction to the number line that is less than $\frac{1}{2}$ or more than $\frac{1}{2}$ in the correct location.

2. TEACHER SAY: Nice work. Each of you will get three cards. Write your name in the top right corner of each card.

TEACHER DO: Distribute note cards.

STUDENTS DO: Write names in the top right corner of each card.

TEACHER SAY: On your first card, write ONE question or problem about ordering fractions on a number line. It can be a question for someone to answer or a problem for someone to solve. After you finish the front of your card, write the answer on the back. I will give you about 4 minutes.

STUDENTS DO: Make a review card for ordering fractions.

TEACHER DO: Repeat the procedure for the addition and subtraction review cards.

STUDENTS DO: Make review cards for addition and subtraction.

TEACHER DO: Give students the entire Reflect time to work on this today. This process will continue in Reflect for the next five lessons, so if they cannot finish all three cards today, they will have time in future math classes. At the end of Reflect, have students store cards (or collect the cards and store them for students until the next math lesson).

Lesson 114 Overview

LESSON OVERVIEW

In this lesson, students play a game to review multiplication facts for 7. They then review place value and solve challenging problems with partners. If students struggle with these problems, this review can be done in small groups or as a whole class. Finally, students continue to work on game cards for the culminating project.

LEARNING OBJECTIVES

Students will:

- Solve place value problems.
- Generate questions or problems to review Primary 3 math.

KEY VOCABULARY

Review place value vocabulary as needed.

LESSON PREPARATION FOR THE TEACHER

- Gather dice (two per pair of students).
- Gather or make three note cards per student.
- Prior to the lesson, draw the following on the board:

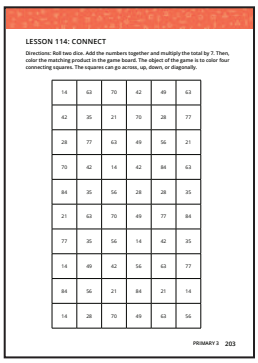
Ten Thousands	Thousands	,	Hundreds	Tens	Ones
		,			

MATERIALS

- Dice (two per pair of students)
- Note cards (three per student)
- Colored pencils or crayons
- Mathematics Student Book

Connect (10 to 15 minutes)

Directions


LESSON 114: CONNECT

Directions: Roll two dice. Add the numbers together and multiply the total by 7. Then, color the matching product in the game board. The object of the game is to color four connecting squares. The squares can go across, up, down, or diagonally.

14	63	70	42	49	63
42	35	21	70	28	77
28	77	63	49	56	21
70	42	14	42	84	63
84	35	56	28	28	35
21	63	70	49	77	84
77	35	56	14	42	35
14	49	42	56	63	77
84	56	21	84	21	14
14	28	70	49	63	56

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1. TEACHER DO: Distribute two dice per partner group and give each student one colored pencil or crayon. The colors should be different for each partner. Have students open Mathematics Student Books to page Lesson 114: Connect and read the directions to themselves.

STUDENTS DO: Turn to the Connect page and read the directions.

TEACHER SAY: Today you and your Shoulder Partner will play a game to review your multiplication facts for 7.

TEACHER DO: Model how to play the game. Explain that they can pick any one of the squares with their product to color in. Tell students they can block their partner by coloring a blocking square (if possible) on their turn.

TEACHER SAY: Today you will choose one partner's book to color squares. If we have time later, you can play another game using the other partner's book.

STUDENTS DO: Play the multiplication fact review game with a partner.

TEACHER SAY: Great work reviewing your multiplication facts for 7.

Learn (35 to 45 minutes)

Directions

1. TEACHER SAY: Today's goal is to use what we know about place value to solve place value problems. Let's review some vocabulary together first.

TEACHER DO: Write the following terms on the board. Assign each partner team (or section of the room) to define one term. After a few minutes defining the terms in small groups, call on some teams to share a definition for each term so the whole class can hear.

- Standard form (a number written with just digits).
- Expanded notation (a number written with the value of each digit added together).
- Word form (a number written with words).
- Digit (the numbers 0–9).
- Place value (the value of the number based on its location. For example, when 3 is written two places from the right, its value is 30.)

2. TEACHER SAY: Great review of place value and number vocabulary. Now let's quickly review some other place value concepts together.

TEACHER DO: Write the number 34,287 on the board in the place value chart.

TEACHER SAY: Say this number with me.

STUDENTS DO: Say the number with the teacher.

TEACHER DO: Ask students to identify the place and value of different digits in the number (do not go in order). For example:

- What place is the 2 in?
- What is the value of the 2?

STUDENTS DO: Identify the place and value of each digit in the number.

TEACHER SAY: Let's see what this number looks like in word form.

TEACHER DO: Write the number in word form on the board: thirty-four thousand, two hundred eighty-seven.

TEACHER SAY: Now let's look at another way to write this number—in expanded form.

TEACHER DO: Write the number underneath in expanded form so that at the end, the following is on the board:

30,000 + 4,000 + 200 + 80 + 7

Note to the Teacher: If students remember these concepts, continue. If not, repeat this several times with different numbers. Then, move on to the next review.

3. TEACHER DO: Write the following numbers on the board:

89,124 98,421 89,241 98,124

TEACHER SAY: Turn to your Shoulder Partner and discuss how to order these numbers from greatest to least. When you agree, put give me a Thumbs Up.

STUDENTS DO: Discuss with a partner how they would order the numbers from greatest to least. Give a **Thumbs Up** to indicate they are finished.

TEACHER DO: Call on a student pair to explain their thinking and rewrite the numbers from greatest to least on the board. Students should understand that when ordering by value, they look at

the digit on the far left first (the number with the greatest place value) and then continue to the next number.

Note to the Teacher: Repeat this with several other numbers if students need additional review. If not, continue on.

TEACHER DO: Write the following on the board: 26 Tens.

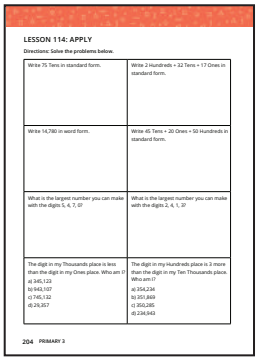
TEACHER SAY: What if I wanted to write 26 Tens in standard form. What number is 26 Tens? Turn and Talk to your Shoulder Partner.

STUDENTS DO: Share thinking with partners.

TEACHER DO: Call on students to explain thinking. They should be able to explain that 10 Tens makes 100, so 26 Tens will make 260. **Model** several more problems like this until students feel comfortable. Then, move on to a problem like the one listed below:

3 Hundreds + 30 Tens + 25 Ones

These types of problems combine an understanding of place value and expressing numbers in standard form.


LESSON 114: APPLY

Directions: Solve the problems below.

Write 75 Tens in standard form.	Write 2 Hundreds + 32 Tens + 17 Ones in standard form.
Write 14,790 in word form.	Write 45 Tens + 20 Ones + 50 Hundreds in standard form.
What is the largest number you can make with the digits 5, 4, 7, 0?	What is the largest number you can make with the digits 2, 4, 1, 3?
The digit in my Thousands place is less than the digit in my Ones place. Who am I? a) 345,123 b) 943,107 c) 745,132 d) 29,357	The digit in my Hundreds place is 3 more than the digit in my Ten Thousands place. Who am I? a) 354,234 b) 351,849 c) 350,285 d) 234,043

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4. TEACHER SAY: Today you have some challenging problems in your student book to solve with your Shoulder Partner. Please turn to page Lesson 114: Apply and begin working.

STUDENTS DO: Turn to the Apply page and work with a partner to solve the place value review problems.

TEACHER DO: Monitor students as they work to check understanding and offer help as needed. When there are 3 to 5 minutes left in Learn, use an **Attention Getting Signal** and work through the most challenging problems with the students. Let students lead this discussion and review as much as possible. Ask students to explain thinking and share strategies.

Reflect (5 to 10 minutes)

Directions

1. TEACHER SAY: Today we will continue to make cards for our Primary 3 math review game. I will give you three cards. Write your name in the upper right hand corner of each card.

TEACHER DO: Distribute cards to students.

STUDENTS DO: Write names on three cards.

TEACHER SAY: You will make three cards today: two cards should be questions or problems about place value. The last card should be questions or problems about subtraction. Make sure you write the answers on the back of the cards.

TEACHER DO: Answer any lingering questions. At the end of Reflect, have students store the cards. Remind students they will continue to make cards for the next several lessons.

Lesson 115 Overview

LESSON OVERVIEW

Students begin this lesson by playing a fluency game. In Learn, students work on elapsed-time problems. Elapsed time is challenging for students, so they may need extra support with this activity. If possible, use a teaching clock to demonstrate the passage of time in each problem. In Reflect, students continue to make game cards to review what they have learned about mathematics in Primary 3.

LEARNING OBJECTIVES

Students will:

- Solve elapsed-time problems.
- Generate questions or problems to review Primary 3 math.

LESSON PREPARATION FOR THE TEACHER

- In this lesson, the teacher chooses a review game for Connect. Gather any materials needed based on the game selected.
- Gather or make three note cards per student.
- Obtain or produce an analog teaching clock with movable hands. If no clock is available use the Analog Clock Face—Large Blackline Master.

KEY VOCABULARY

- Elapsed

MATERIALS

- Materials for Connect game
- Analog teaching clock
- Thinking Like a Mathematician anchor chart
- Note cards (three per student)
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions

1. TEACHER DO: Choose from one of the following activities for the Connect time.

- **Mystery Multiplication**: The teacher tells the class one of the factors. Then, the student rolls a die or selects a number card and multiplies the factor by the die roll or number card picked. Example: Factor chosen is 4 and die roll is 5. Student solves 4 × 5.
- **Roll and Draw**: (Grid paper needed) Students roll one die twice or draw two cards. Students then draw an array to match the fact, solve the problem, and record the product.
- **Share the Counters**: The teacher writes three division equations on the board. Students use counters to solve the problem, record the equation, and make a drawing to show the quotient.
- **Word Wizards**: The teacher writes two or three story problems on the board and students work together to solve. The problems can be all multiplication, all division, or a combination.
- **Number Battle**: Each student gets a deck of number cards 0 to 12. Both decks are placed number side down between partners. Each student turns over their top two cards and multiplies them to find the product. Whoever has the greater product takes all four cards. Students continue until one player has no cards. They then reshuffle and play again until time is up.
- **Skip Counting**: Students play in pairs. Each pair receives one die or a set of number cards 0 to 12. One partner rolls the die or picks a card. The second partner states the first 12 multiples of the selected number. Students can use the 120 Chart if necessary for support.

STUDENTS DO: Work on the chosen fact practice for the Connect time with a partner or independently.

Learn (35 to 45 minutes)

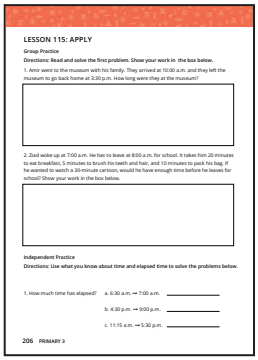
Directions

1. TEACHER SAY: Today our learning goal is to solve elapsed-time problems. Think for a minute about what that might mean and then give me a Thumbs Up to share.

STUDENTS DO: Think quietly for a moment. Give a **Thumbs Up** to volunteer. Selected students share understanding of elapsed time.

TEACHER DO: Clarify that elapse means to pass, so students will be working on problems where time passes.

TEACHER SAY: Time is passing all around us. We get up in the morning, eat breakfast, come to school, work hard, and so on. All of these activities take time, and today we will work through some story problems looking at those situations. We will be thinking like mathematicians as we make sense of problems, attend to precision, and reason with numbers (reference the Thinking Like a Mathematician anchor chart).


LESSON 115: APPLY

Group Practice

Directions: Read and solve the first problem. Show your work in the box below.

1. Amir went to the museum with his family. They arrived at 10:00 a.m. and they left the museum to go back home at 2:30 p.m. How long were they at the museum?

2. Ziad woke up at 7:00 a.m. He has to leave at 8:00 a.m. for school. It takes him 20 minutes to eat breakfast, 5 minutes to brush his teeth and hair, and 10 minutes to pack his bag. If he wanted to watch a 30-minute cartoon, would he have enough time before he leaves for school? Show your work in the box below.

Independent Practice

Directions: Use what you know about time and elapsed time to solve the problems below.

1. How much time has elapsed? a. 6:30 a.m. → 7:00 a.m. _____

b. 4:30 p.m. → 9:00 p.m. _____

c. 11:15 a.m. → 5:30 p.m. _____

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2. TEACHER DO: Have students open Mathematics Student Books to page Lesson 115: Apply and solve the first problem under Group Practice. When finished, they should share solutions and strategies with a **Shoulder Partner**.

STUDENTS DO: Turn to the Apply page and solve the first Group Practice problem. Share solutions with a **Shoulder Partner**.

TEACHER DO: After about 3 minutes, call on two or three students to share thinking with the group. Students may say the following:

- I knew it was 2 hours from 10:00 to 12:00 and then 3 more hours to 3:00, plus 30 more minutes to 3:30, so 5 hours and 30 minutes.
- I counted on from 10:00: 11:00, 12:00, 1:00, 2:00, 3:00, so I knew it was 5 hours, and then I added the last 30 minutes.

Clarify any confusion and, if necessary, use a teaching clock or draw analog clocks on the board, showing the first time and the second time to model how much time has passed.

3. TEACHER SAY: Let's look at the second problem under Group Practice. In this problem, Ziad is doing a bunch of things before leaving for school, but he also wants to watch a cartoon. Does he have enough time? Read the problem to yourself and then talk to your Shoulder Partner about how you could solve this elapsed-time problem. Give me a Thumbs Up to share your ideas.

STUDENTS DO: Discuss problem-solving strategy with a partner. Give a **Thumbs Up** when ready to share. Selected students share thinking with the class.

TEACHER DO: Students should conclude that Ziad would not have enough time to watch a cartoon before school. Clarify and review if necessary that there are 60 minutes in an hour, 24 hours in a day, 30 minutes in a half hour, and so on. All of this has been covered, but some students may need review to be successful with the story problems. Possible example of modeling using a bar model:

Breakfast	Teeth and Hair	Pack	Cartoon
20 minutes	5 minutes	10 minutes	30 minutes

20 + 5 + 10 + 30 = 65 minutes

4. TEACHER SAY: For the rest of class today you will work on elapsed-time problems. Some of the problems ask you to tell how much time has elapsed between two given times or two analog clocks, and some are story problems. Elapsed time can be challenging, so you will work with your Shoulder Partner. If you and your partner finish early, you may try the Challenge problems.

STUDENTS DO: Spend the rest of Learn working with a partner to solve elapsed time problems in the student book. Students who finish early may try the Challenge problems.

TEACHER DO: Walk around the room, observing students as they work. Check in with students who may be struggling. Consider pulling some students to work with you in a small group if needed. Ask students to explain their thinking as you are checking in. When Learn is over, use an **Attention Getting Signal**.

TEACHER SAY: **I saw so much hard work happening today as you were thinking about time and solving problems. Keep out your book for Reflect. You can use it to help you make your game cards.**

Reflect (5 to 10 minutes)

Directions

1. TEACHER DO: Distribute note cards to students, reminding them to write names on the cards. Remind students that they will be making cards with questions or problems to review skills and concepts they have learned in Primary 3. Students should make one card about elapsed time and two cards about multiplication. Students should write the answers on the backs of the cards.

Walk around as students are working and offer assistance as needed.

STUDENTS DO: Spend the Reflect period working on game cards.

TEACHER DO: At the end of the math lesson, have students store game cards.

Lesson 116 Overview

LESSON OVERVIEW

Students begin this lesson reviewing multiplying by 10s and discussing the patterns they observe when multiplying by 10s. In Learn, students work in small groups to measure objects to the nearest half centimeter and draw a line plot to display the data. They make line plots from given data sets and ask and answer questions about the data using the line plots. In Reflect, students continue to make game cards, adding questions about line plots and division.

LEARNING OBJECTIVES

Students will:

- Measure objects to the nearest half centimeter.
- Use measurement data to make line plots.
- Analyze line plots to answer questions about the data.
- Generate questions or problems to review Primary 3 math.

KEY VOCABULARY

- Centimeters
- Data
- Key
- Line plot

MATERIALS

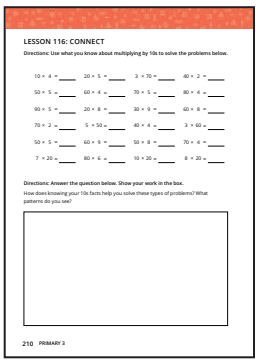
- Centimeter rulers (one per student)
- Bags of 12 straws, sticks, or pieces of string (one bag per small group of students)
- Thinking Like a Mathematician anchor chart
- Note cards (three per student)
- Mathematics Student Book and pencil

LESSON PREPARATION FOR THE TEACHER

- Prior to the lesson, divide the class into groups of four or five students and post the groups on the board. Think about students who work well together and how to support those who might need more help.
- Prepare bags of 12 straws, sticks, or pieces of string (one bag per small group of students) for a measurement activity. See Chapter Preparation for Lesson 116 for detailed instructions.
  - Note: This lesson will refer to straws. Change the reference if you are using items other than straws.
- Gather or make three note cards per student.
- Gather centimeter rulers (one per student).

Connect (10 to 15 minutes)

Directions


LESSON 116: CONNECT

Directions: Use what you know about multiplying by 10s to solve the problems below.

10 × 4 = ___ 20 × 5 = ___ 3 × 70 = ___ 40 × 2 = ___

50 × 5 = ___ 60 × 4 = ___ 70 × 5 = ___ 80 × 4 = ___

90 × 5 = ___ 20 × 8 = ___ 30 × 9 = ___ 60 × 8 = ___

70 × 2 = ___ 5 × 50 = ___ 40 × 4 = ___ 3 × 60 = ___

50 × 5 = ___ 60 × 9 = ___ 50 × 8 = ___ 70 × 4 = ___

7 × 20 = ___ 80 × 6 = ___ 10 × 20 = ___ 8 × 20 = ___

Directions: Answer the question below. Show your work in the box.

How does knowing your 10s facts help you solve these types of problems? What patterns do you see?

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1. TEACHER DO: Have students open Mathematics Student Books to page Lesson 116: Connect and read the directions to themselves. Ask students to share what they remember about multiplying by 10s.

STUDENTS DO: Turn to the Connect page and read the directions. Selected students share what they know about multiplying by 10s.

TEACHER DO: If necessary, review the pattern by completing the first three as a class (or with a small group of students).

STUDENTS DO: Work independently in student book to solve as many multiplication fact review problems as they can.

TEACHER DO: After about 5 minutes, stop students and have them answer the questions at the bottom of the page.

STUDENTS DO: Respond in writing to the questions at the bottom of the page.

TEACHER DO: After about 3 minutes, ask for volunteers to share written reflection responses.

TEACHER SAY: **Mathematicians look for patterns in their work. This helps them make sense of the mathematics they are learning and exploring. It can also make the work easier, since they can use the patterns they observe to work more quickly.**

Learn (35 to 45 minutes)

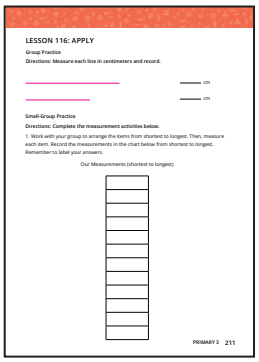
Directions

1. TEACHER SAY: **Today our learning goal is to review line plots and measurement. We will also compare measurements using the information from a line plot. Who can remind us what a line plot is and how it is different from a bar graph or a pictograph? Raise your hand to share your thinking.**

STUDENTS DO: Raise hand to volunteer. Selected students share thinking with the class.

TEACHER DO: Make sure that students have the following key understandings:

- All three graphs are ways to show data or information.
- Bar graphs use bars to show data.
- Pictographs represent the data with pictures.
- Line plots are a quick way to show the frequency of data (how often a data point occurs) on a number line using Xs.


LESSON 116: APPLY

Group Practice

Directions: Measure each line in centimeters and record.

Small-Group Practice

Directions: Complete the measurement activities below.

1. Work with your group to arrange the items from shortest to longest. Then, measure each item. Record the measurements in the chart below from shortest to longest. Remember to label your answers.

Our Measurements (shortest to longest)

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2. TEACHER SAY: **Today we are going to collect some measurement data and use a line plot to record that data. Please turn to page Lesson 116: Apply and read the directions to yourself.**

TEACHER DO: As students are finding the page, distribute centimeter rulers (or have students take them out).

STUDENTS DO: Turn to the Apply page and read the directions silently.

TEACHER SAY: **Use your ruler to measure the two lines under Group Practice. Give me a Thumbs Up when you are finished measuring and recording your answers.**

STUDENTS DO: Measure each line and record answers. Give a **Thumbs Up** when they are finished.

TEACHER DO: Call on students to share measurements. The first line is 8 cm long. The second line is $5\frac{1}{2}$ cm long. Some students may round up to 6 cm or down to 5 cm.

TEACHER SAY: **The second line is not an exact centimeter measurement. The line falls exactly between 5 and 6. Line up your ruler to measure the second line again.**

STUDENTS DO: Line up ruler to measure the second line.

TEACHER SAY: **Between what two numbers does the line end?**

STUDENTS DO: Call out answers.

TEACHER SAY: **It falls halfway between 5 centimeters and 6 centimeters. It is not quite to 6 centimeters, so we know it is at least 5 centimeters long, plus another half of a centimeter. We record that measurement using fractions. The line is $5\frac{1}{2}$ centimeters long. You are going to measure other items today. Some of them may not measure to exact, whole centimeters. We want to be precise mathematicians and use our tool, the ruler, correctly (reference Thinking Like a Mathematician chart). If your object measures halfway between two numbers, you must use a fraction to record an accurate measurement. What questions do you have?**

STUDENTS DO: Ask clarifying questions as needed.

3. TEACHER DO: Help students resolve misunderstandings. Confirm correct thinking. Then, help students move into groups. Students should take books, rulers, and pencils with them. Go over the directions for the first Small-Group Practice activity (measuring straws and creating a line plot). Distribute bags of straws and have students begin working together to complete the activity.

TEACHER SAY: Remember to help each other and work together. Even though you are working together, each of you should record the lengths in your own and make a line plot in your book. Give me a Thumbs Up when your group has completed the straw measurement and line plot activity.

STUDENTS DO: Move to work with small group with necessary supplies. Collaborate with group members to measure straws and record measurements in order from shortest to longest. Use the data to make a line plot. Give a **Thumbs Up** when finished.

TEACHER DO: As students are working, draw the line plot from the Small-Group Practice activity on the board. Walk around and observe students as they work to measure, record measurements, and make a line plot. When most of the groups are finished, bring them back together using an **Attention Getting Signal**.

4. TEACHER SAY: Let's take a look at the data you collected.

TEACHER DO: Have students read measurements out to you (they should be able to do this as a group). Record the measurements on the board in order from shortest to longest. Call on students to use the data to make a line plot on the board (one student per X). Ask students to explain their thinking and how they know where to place each X. Encourage students to check work using the line plot on the board and make corrections if necessary. Clarify any misconceptions and confirm accurate thinking.

STUDENTS DO: Help make a line plot on the board, explaining reasoning and process.

5. TEACHER DO: When finished, have students work with groups to complete the remaining Small-Group Practice activities. Students who finish early may work together on the Challenge problem.

STUDENTS DO: Collaborate to complete the Small-Group Practice activities. Students who finish early may collaborate on the Challenge problem.

TEACHER DO: When 5 minutes are left in Learn, bring the group back together and have them return to their own seats.

6. TEACHER SAY: You all did a lot of hard work making line plots to show your measurement data. Before Reflect, let's look at the straw measurement line plot on the board. What questions could I ask that could be answered using this line plot? Raise your hand when you have an idea.

STUDENTS DO: Think of a question that could be answered using the line plot on the board. Share questions.

Note to the Teacher: This exercise is an interesting way to see if students are able to interpret the data on the line plot. Some students may ask simple observation questions related to how many times a particular data point appears on the line plot. Others may be able to ask more complex questions that require a comparison of the data or addition or subtraction of the data.

TEACHER SAY: Good job. Like all graphs, line plots give us information about data, and we can answer questions about the data using the information we see.

Reflect (5 to 10 minutes)

Directions

1. TEACHER DO: Distribute note cards to students. Remind them to write names on the cards. Remind students that they will be making cards with questions or problems to review skills and concepts they have learned in Primary 3. Students should produce one card about line plots and two cards about division. Students should write the answers on the backs of the cards.

Walk around as students are working and offer assistance as needed.

STUDENTS DO: Spend the Reflect period working on game cards.

TEACHER DO: At the end of the math lesson, have students store game cards.

Lesson 117 Overview

LESSON OVERVIEW

In this lesson, students review division facts for 3s and 4s. In Learn, students roll a die to collect data. They use that data to make both a line plot and a bar graph. Finally, they analyze graphs to answer questions about the data and engage in a discussion about the best way to display the data they collected. In Reflect, they continue to make game cards for the Primary 3 mathematics review game they will design in Lesson 118.

LESSON PREPARATION FOR THE TEACHER

- Gather six-sided dice (one die per pair of students).
- Gather note cards (three per student).

LEARNING OBJECTIVES

Students will:

- Collect and record data in a table.
- Use collected data to make a line plot.
- Use collected data to make a bar graph.
- Analyze graphs to answer questions about the data.
- Compare the effectiveness of line plots and bar graphs to display data.
- Generate questions or problems to review Primary 3 math.

KEY VOCABULARY

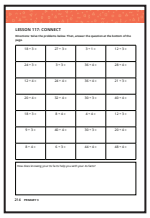
- Axis
- Bar graph
- Categorical data
- Frequency
- Line plot
- Scale

MATERIALS

- Six-sided die (one per pair of students)
- Note cards (three per student)
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions



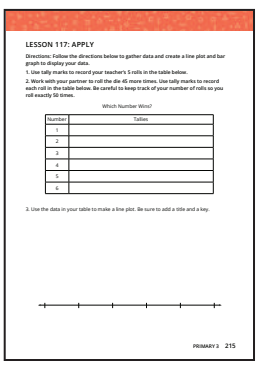
1. TEACHER DO: Have students open Mathematics Student Books to page Lesson 117: Connect and read the directions. Make sure students understand the directions and have them begin working.

STUDENTS DO: Turn to the Connect page and work independently to complete the division fact review problems for 3s and 4s.

TEACHER DO: At the end of Connect, use an **Attention Getting Signal** and go over the answers. Ask a few students to share responses to the question at the bottom of the page.

Learn (35 to 45 minutes)

Directions


LESSON 117: APPLY

Directions: Follow the directions below to gather data and create a line plot and bar graph to display your data.

1. Use tally marks to record your teacher's 5 rolls in the table below.
2. Work with your partner to roll the die 45 more times. Use tally marks to record each roll in the table below. Be careful to keep track of your number of rolls so you roll exactly 50 times.

Which Number Wins?

Number	Tallies
1	
2	
3	
4	
5	
6	

3. Use the data in your table to make a line plot. Be sure to add a title and a key.

PRIMARY 3 215

1. TEACHER SAY: Today our learning goal is to collect some data and then represent that data in more than one way. Who can quickly remind us of the three types of graphs we have explored this year in Primary 3? Raise your hand to share.

STUDENTS DO: Raise hands to volunteer to share answers. (Students should note line plots, bar graphs, and pictographs.)

TEACHER SAY: Bar graphs and pictographs show data that is in categories, such as the number of people who like strawberries versus blueberries or how many students walk to school versus ride a bike. Line plots show the frequency of a data set, or how many times a piece of data appears, such as how many students in a class have 1 sibling or 3 siblings or how many straws in our bags measured exactly 6 centimeters. Today we are going to collect some data that we can represent using a line plot and a bar graph. Please turn to page Lesson 117: Apply in your book.

STUDENTS DO: Turn to the Apply page.

TEACHER DO: As students are finding the correct page, draw the table below on the board.

Number	Tallies
1	
2	
3	
4	
5	
6	

TEACHER SAY: We are going to collect data about the frequency, or the number of times, we roll a certain number on a single die when we roll it 50 times. I am going to do the first 5 rolls and record the data in the table on the board. You record the data in the table in your book.

TEACHER DO: Roll one die 5 times. For each roll, announce the number and record a tally in the matching row in the table. Make sure students are recording your data as well.

STUDENTS DO: Use tally marks to record the teacher's data in the data table.

TEACHER DO: Remind students how to mark the fifth tally in a group by drawing a line through the first four tally marks as shown below. (The direction of the fifth line does not matter, as long as it is drawn through the first four lines.)

2. TEACHER SAY: We are going to stop here, and you will continue with your Shoulder Partner taking turns to roll the die and record. You will roll the die 45 more times. Be sure to keep track of how many times you have rolled and record your data carefully in the table. You and your partner will then use your data to make a line plot in your student book. Even though you are working together, be sure you each record the data and make a line plot in your own book. Since each set of partners will have different data, all of our line plots will not look the same. Raise your hand when you are finished with problems 2 and 3. What questions do you have?

STUDENTS DO: Ask clarifying questions if needed. Work with **Shoulder Partner** to collect and record data and then use the data to make a line plot. Raise hands to signal that they have completed the line plot.

TEACHER DO: After 10 to 15 minutes, use an **Attention Getting Signal**.

3. TEACHER SAY: If you are not finished, just pause. You can go back to your work in a moment. We also want to display our data in a bar graph. What do you remember about creating bar graphs? Give me a Thumbs Up to share your thinking.

STUDENTS DO: Think for a moment about how to make a bar graph. Give a **Thumbs Up** to volunteer to share thinking with the class.

Note to the Teacher: Ensure that students understand the following:

- *The horizontal and vertical axes of bar graphs must be labeled.*
- *The vertical axis usually has numbers.*
  - *The numbers have a scale. Each line on the bar graph can represent 1, 2, 5, or 10 (or any other numbers).*
- *Today's bar graph should have a scale of 1 or 2. It may be difficult to analyze the data if students use a scale of 5 or 10. The horizontal axis usually represents the different pieces of data.*
  - *The bars in today's graph will represent the total number of times a certain number was rolled.*
- *Every bar graph needs a title.*

4. TEACHER DO: Once you feel comfortable with students' understanding of bar graphs, go over

the directions for the bar graph and the questions that follow. Then, have students continue working with a partner to complete the activity.

STUDENTS DO: Ask clarifying questions if necessary. Continue working on line plots and bar graphs. When finished with the graphs, analyze the data to answer the questions at the end of the activity.

TEACHER DO: Walk around and observe students as they work. Offer assistance if necessary. When there are 5 minutes left in Learn, use an **Attention Getting Signal**.

5. TEACHER SAY: Before we start Reflect, I am curious about which type of graph you think shows this data in the best way. Stand up if you think the line plot is the best way to represent this data. Stay seated if you think the bar graph is better. I will use Calling Sticks to choose some of you to explain your thinking.

STUDENTS DO: Stand or sit to show thinking. Selected students explain reasoning to the class.

Note to the Teacher: This question does not have a right or wrong answer. Instead, this exercise allows students to share mathematical thinking and construct viable arguments, which is powerful evidence of learning.

TEACHER SAY: You did a great deal of hard work today collecting and graphing data. You should be proud of your efforts.

Reflect (5 to 10 minutes)

Directions

1. TEACHER DO: Distribute note cards to students. Remind them to write names on the cards. Remind students that they will be making cards with questions or problems to review skills and concepts they have learned in Primary 3. Students should produce two cards about collecting and displaying data and one card about fractions. Students should write the answers on the backs of the cards.

Walk around as students are working and offer assistance as needed.

STUDENTS DO: Spend the Reflect period working on game cards.

TEACHER DO: At the end of the math lesson, have students store game cards.

Lesson 118 Overview

LESSON OVERVIEW

Students begin this lesson by playing a game to review previously taught concepts. In Learn, students follow a set of guidelines to make a game board using quadrilaterals and non-quadrilaterals as game spaces. They calculate and record the area and perimeter of each shape they draw and use what they know about area and perimeter to produce game cards for the Primary 3 mathematics review game.

LEARNING OBJECTIVES

Students will:

- Draw quadrilaterals and non-quadrilaterals on grid paper to produce a game board.
- Find the area and perimeter of each shape on the game board.
- Generate questions or problems to review Primary 3 math.

LESSON PREPARATION FOR THE TEACHER

- In this lesson, the teacher chooses a review game for Connect. Gather any materials needed based on the game selected.
- Gather or make note cards (three per student).
- Print one-centimeter grid paper using the 1-Centimeter Grid Blackline Master. You will need at least one sheet per student.

KEY VOCABULARY

Review previous vocabulary as needed.

MATERIALS

- Materials for Connect game
- Crayons or colored pencils
- 1-centimeter grid paper (one sheet per student)
- Note cards (three per student)
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

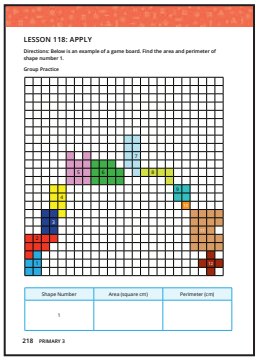
Directions

1. TEACHER DO: Choose from one of the review activities listed in Lesson 115: Connect. Review the directions as needed and have students play the game.

STUDENTS DO: Work on the chosen fact practice for the Connect time with a partner or independently.

Learn (35 to 45 minutes)

Directions


LESSON 118: APPLY

Directions: Below is an example of a game board. Find the area and perimeter of shape number 1.

Group Practice

Shape Number	Area (square cm)	Perimeter (cm)
1		

218 PRIMARY 3

1. TEACHER SAY: You have been working hard to generate math review questions for your game. You will also need to make a game board for this game. Your game board will help us meet today's learning goal of reviewing area and perimeter. Turn to page Lesson 118: Apply in your student book and look at the game board under Group Practice. Raise your hand to tell me some things you notice about the game board.

STUDENTS DO: Turn to the Apply page and look at the sample game board under Group Practice. Raise hands to volunteer and share thinking.

TEACHER SAY: You are going to produce your own game board for your Primary 3 mathematics review game. You will draw shapes like the ones on this grid to make a pathway through your game. Look at shape number 1. What is the area of that shape? Raise your hand when you know.

STUDENTS DO: Find the area of shape number 1. Raise hands to volunteer and share answers.

TEACHER DO: Repeat for the perimeter of shape number 1. Have students record both measurements in the student book.

STUDENTS DO: Record the area and perimeter of shape number 1.

2. TEACHER SAY: **Today your job is to design and decorate your game board.**

TEACHER DO: Direct students' attention to the Independent Work section of the Apply page. Go over the game board guidelines in the student book with students. Answer any questions students have about how to produce the game boards. Distribute grid paper and any other supplies students may need and have students begin working. Encourage students who finish early to try the Challenge problems.

STUDENTS DO: Work independently to produce game boards following the guidelines in the student book. Students who finish early may try the Challenge problems.

TEACHER DO: Walk around and observe students as they work. Offer assistance as needed.

Note to the Teacher: If any students were able to try the perimeter part of the Challenge problem, set aside time to talk with them about their work. Discuss why they cannot add up all of the perimeters to find the total perimeter because some of the shapes share sides. At this point, it might not be apparent to some students, which is fine since it is a Challenge question.

TEACHER DO: At the end of Learn, use an **Attention Getting Signal**. Have students either store game boards or give them to you to store until the next math lesson.

Reflect (5 to 10 minutes)

Directions

1. TEACHER DO: Distribute note cards to students. Remind them to write names on the cards. Remind students that they will be making cards with questions or problems to review skills and concepts they have learned in Primary 3. Students should produce three cards about area and perimeter. Students should write the answers on the backs of the cards.

Walk around as students are working and offer assistance as needed.

STUDENTS DO: Spend the Reflect period working on game cards.

TEACHER DO: At the end of the math lesson, have students store game cards.

TEACHER SAY: **You did great work creating the boards for your games today. You will get to play your game during our next math lesson.**

Lesson 119 Overview

LESSON OVERVIEW

In this lesson, students play the games they created. The games allow them to review the mathematics skills and concepts they learned in Primary 3. They end by reflecting on what worked well in the games, and what needs improvement.

LEARNING OBJECTIVES

Students will:

- Review mathematics skills and concepts from Primary 3.
- Identify what went well with the games and what they would improve.

LESSON PREPARATION FOR THE TEACHER

- Gather items students can use as game pieces. Each student will need a game piece that is different from their partner's game piece.

KEY VOCABULARY

Review previous vocabulary as needed.

MATERIALS

- Note cards generated by students
- Game boards produced by students
- Game pieces (one per student)
- Additional note cards (for students who need them)

Connect (10 to 15 minutes)

Directions

1. TEACHER SAY: For today's Connect, you will review your own game cards and double-check your work. This is the time to make any changes you may need to make, check that the answers on the back of your cards are correct, make sure your names are on the front, and produce any more cards that you want for the game. Please take out your cards and begin. Raise your hand if you need help.

STUDENTS DO: Double-check answers and add cards to the game if desired.

TEACHER DO: Walk around the room and monitor students' work. Check to see that they have the answers correctly written on the back of each card. If many students need your assistance, consider sending them to a friend who has mastered the content they need help with. Hand out additional cards to students who request them.

Learn (35 to 45 minutes)

Directions

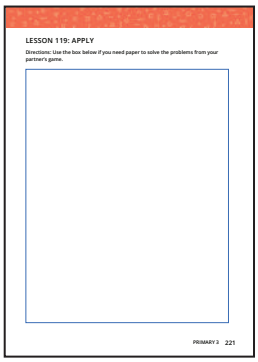
1. TEACHER SAY: Today our learning goal is to review all the skills you learned in Primary 3 by playing each other's games. When you play your game, you and your partner will start on the shape marked 1. Your partner will ask you a review question from the cards they have been creating. If you answer the review question correctly, you move on to shape number 2, and then your partner takes a turn. You ask your partner a question from your set of cards. If you answer a question incorrectly, you do not move. What questions do you have about how to play the game?

STUDENTS DO: Raise hands to ask a question about game play.

TEACHER DO: Clarify students' understanding about game play. Doing so now will save you time later when they start to play the games in partners.

TEACHER SAY: You will play on one partner's game board for the first half of Learn. Halfway through the class, I will ask you to switch to play on the other partner's game board. You may not finish, but this way you both get a chance to use your game boards. If you finish the first partner's game board early, you can go ahead and switch to the second partner's game board. Let's use Hands Up Pair Up to find a partner. You will need your game board, Mathematics Student Book, pencil, and game cards.

STUDENTS DO: Play **Hands Up Pair Up** to find a partner. Take game boards, student books, pencils, and game cards and sit with a partner.


LESSON 119: APPLY

Directions: Use the box below if you need paper to solve the problems from your partner's game.

PRIMARY 3 221

2. TEACHER DO: Once students are settled, give each a game piece. Make sure partners do not have the same game piece. Then, have students open Mathematics Student Books to page Lesson 119: Apply. They can use the space provided if they need paper to solve any review problems.

STUDENTS DO: Turn to the Apply page.

TEACHER SAY: Begin playing.

STUDENTS DO: Play the review game on one of the partner's game boards.

TEACHER DO: Walk around the room and monitor game play. If you see partners doing something exceptionally well, like helping each other or using student books to show work, use an **Attention Getting Signal** to pause the class and bring positive attention to the pair. After Learn time is halfway over, use an **Attention Getting Signal** and have students switch to the other partner's game board. (They should start at space number 1 again.)

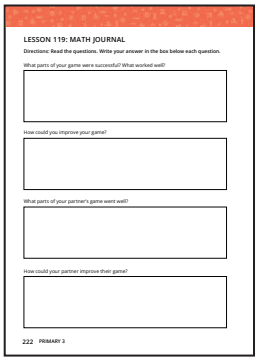
STUDENTS DO: Play on the other partner's game board. Help partner solve difficult problems. Use the student book to solve problems if necessary.

TEACHER DO: At the end of Learn, have students return to their seats. Collect all game pieces and have students store game boards and cards.

TEACHER SAY: It was very exciting watching you play original games and reading questions you wrote. I am so proud of you and all of your hard work. Please keep your student book out for Reflect.

Reflect (5 to 10 minutes)

Directions


LESSON 119: MATH JOURNAL

Directions: Read the questions. Write your answer in the box below each question.

What parts of your game were successful? What worked well?

How could you improve your game?

What parts of your partner's game went well?

How could your partner improve their game?

222 PRIMARY 3

1. TEACHER SAY: Part of thinking like a mathematician is thinking about what went well and what you would like to improve for next time. Good mathematicians also help others with their work. For today's Reflect, I want you to think about what went well today with your game and what you could do to make it better. Please turn to page Lesson 119: Math Journal and respond to the questions on the page. We will share some of these with the class after you have had time to think and write independently.

STUDENTS DO: Turn to the Math Journal page. Respond to the four reflection questions about the games.

TEACHER DO: After about 4 minutes, ask students to share thinking about the games they played.

STUDENTS DO: Selected students share observations with the class.

TEACHER SAY: Give yourself a pat on the back for doing excellent work today.

STUDENTS DO: Pat themselves on the back.

Lesson 120 Overview

LESSON OVERVIEW

In this lesson, students review and reflect on all of the work they have accomplished over the course of the school year. They list the new skills they learned, identify how confident they feel with each one, and design ways to practice and continue learning over the summer as they prepare for Primary 4. Finally, students reflect on themselves as learners from the beginning of the year to the end of the year and draw self-portraits that illustrate growth and development.

LEARNING OBJECTIVES

Students will:

- Produce a personal plan for summer learning.
- Reflect on growth and development as mathematicians in Primary 3.

LESSON PREPARATION FOR THE TEACHER

No additional preparation needed.

KEY VOCABULARY

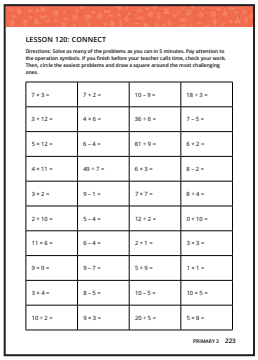
Review previous vocabulary as needed.

MATERIALS

- Crayons or colored pencils
- Mathematics Student Book and pencil

Connect (10 to 15 minutes)

Directions


LESSON 120: CONNECT

Directions: Solve as many of the problems as you can in 5 minutes. Pay attention to the operation symbols. If you finish before your teacher calls time, check your work. Then, circle the easiest problems and draw a square around the most challenging ones.

7 × 3 =	7 ÷ 2 =	10 − 9 =	18 ÷ 3 =
3 × 12 =	4 × 6 =	36 ÷ 6 =	7 − 5 =
5 × 12 =	6 − 4 =	81 ÷ 9 =	6 ÷ 2 =
4 × 11 =	49 ÷ 7 =	6 × 3 =	8 − 2 =
3 × 2 =	9 − 1 =	7 × 7 =	8 ÷ 4 =
2 × 10 =	5 − 4 =	12 ÷ 2 =	0 × 10 =
11 × 6 =	6 − 4 =	2 × 1 =	3 × 3 =
9 × 9 =	9 − 7 =	5 × 9 =	1 × 1 =
3 × 4 =	8 − 5 =	10 − 5 =	10 × 5 =
10 ÷ 2 =	9 × 3 =	20 ÷ 5 =	5 × 8 =

PRIMARY 3 223

1. TEACHER DO: Have students open Mathematics Student Books to page Lesson 120: Connect and read the directions. Tell students they will have 5 minutes to complete as many problems as they can. They should put pencils down immediately when you tell them to stop working.

STUDENTS DO: Turn to the Connect page and work independently to complete the review problems.

TEACHER DO: At the end of Connect, use an **Attention Getting Signal** and go over the answers. Ask a few students to share reflections about which problems are still challenging for them. Encourage students to share helpful strategies with each other.

TEACHER SAY: Today's Connect was a review of all four operations. During Learn, you will think about all that you have learned this year in math.

Learn (35 to 45 minutes)

Directions


LESSON 120: APPLY

Directions: Create a list of the math skills you have learned in Primary 3. Then, circle the thumb that best describes your understanding of each skill. Finally, identify and list ways you can practice the "thumb-sideways" and "thumb-down" skills over the summer.

Skill Learned	My Understanding of the Skill	Ways for Me to Practice

224 PRIMARY 3

1. TEACHER SAY: In our last several math classes, you made original games to help you review some of the things you learned this year as Primary 3 mathematicians. Today's goal is to make a plan for your own summer learning based on what you have mastered and what you still need to study and practice. Let's begin by listing of all the skills you have learned in Primary 3. Turn to page Lesson 120: Apply and read the directions to yourself.

STUDENTS DO: Turn to the Apply page and read the directions silently.

TEACHER SAY: In the table there is a column for you to write down the math skills we learned in Primary 3. Turn and Talk to your Shoulder Partner and see how many different skills you can think of and then write them in your student book.

STUDENTS DO: Work with a partner to list the math skills they have learned in Primary 3.

TEACHER DO: Give students 5 to 7 minutes to record lists. Then, use **Calling Sticks** to have students share answers. Record the skills on the board, allowing space to later add how to practice each

skill. Identify skills students have omitted for them to add to the tables. Allow students to continue to contribute to the list. Some of the skills may include (but are not limited to) the following:

- Place value
- Line plots
- Comparing fractions
- Drawing fraction models
- Fractions on the number line
- Equivalent fractions
- Adding
- Subtracting
- Solving story problems
- Using arrays
- Perimeter
- Area
- Graphing
- Telling time
- Measuring length, mass, and volume
- Multiplying
- Dividing
- Using greater than and less than
- Ordering numbers

2. TEACHER SAY: Our list is long. You have learned a lot this year. Now, let's look at the second column in your student book. Please circle the thumb that best describes how you feel about your understanding of each skill.

 **STUDENTS DO:** Circle a thumb for each skill listed in the student book.

TEACHER DO: Give students 1 to 2 minutes to work.

3. TEACHER SAY: The final column is Ways for Me to Practice. Let's Brainstorm a list together of things you can write in this column. Choose a skill from our list and give us a strategy for practicing the skill and improving our ability.

TEACHER DO: Call on students to share ideas and write them on the board. Many of these skills could be practiced by playing games at home with their families. Additional ideas may include (but are not limited to):

- Playing games with number cards (these can be given to students to take home at the end of class).
- Making multiplication fact cards.
- Looking for, or creating, graphs.
- Taking student books home and having a parent, sibling, or friend write out some of the problems on a separate sheet of paper and redoing the problems.
- Playing the games taught and reviewed during Connect, including:
  - Mystery Multiplication
  - Roll and Draw
  - Share the Counters
  - Word Wizards
  - Number Battle
  - Skip Counting

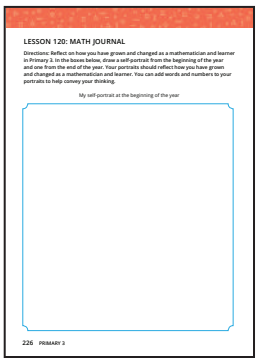
Give students time to record some of the strategies for the skills for which they circled a sideways or downward thumb.

 **STUDENTS DO:** Record practice strategies.

TEACHER DO: At the end of Learn, use an **Attention Getting Signal**. Tell students they can continue to add to the Ways for Me to Practice list if they think of new practice strategies. Ask students to keep student books out for Reflect.

Reflect (5 to 10 minutes)

Directions


LESSON 120: MATH JOURNAL

Directions: Reflect on how you have grown and changed as a mathematician and learner in Primary 3. In the boxes below, draw a self-portrait from the beginning of the year and one from the end of the year. Your portraits should reflect how you have grown and changed as a mathematician and learner. You can add words and numbers to your portraits to help convey your thinking.

My self-portrait at the beginning of the year

226 PRIMARY 3

1. TEACHER DO: Have students turn to page Lesson 120: Math Journal.

STUDENTS DO: Turn to the Math Journal page.

TEACHER SAY: **Today's Reflect is a little different than the ones we have done in the past. I would like you to take your mind all the way back to the beginning of Primary 3. Think about who you were as a mathematician and a learner at the beginning of the school year. How did you feel about math? What did you think about your learning and ability in math?**

STUDENTS DO: Think quietly about math abilities and perspectives at the beginning of Primary 3.

TEACHER DO: After 1 minute, get students' attention.

2. TEACHER SAY: **Now, I want you to bring your mind forward over the school year to today. How have you changed as a mathematician? How have you changed as a learner? Have your feelings about math changed? Do you think your abilities in learning and doing math have changed? You may also want to think about our Thinking Like a Mathematician chart. Did you learn to persevere? Use tools as a mathematician? Draw models to help you solve problems?**

STUDENTS DO: Think quietly about math abilities and perspectives at the end of Primary 3.

TEACHER DO: After 1 minute, get students' attention again.

3. TEACHER SAY: **In your student book you will draw two pictures. One will be a self-portrait from the beginning of the year and the other will be a self-portrait of today. Your portraits should show how you have changed as a mathematician and a learner from the beginning of Primary 3 to today. You may also use words and numbers in your self-portraits.**

STUDENTS DO: Work in student books to draw two self-portraits that illustrate their development as mathematicians and learners over the course of Primary 3.

4. TEACHER DO: When 3 minutes are left in Reflect, clap once to signal the start of a **Gallery Walk**. Give students a few minutes to walk around looking at each other's self-portraits. Clap twice and then call on students to share compliments and ask questions.

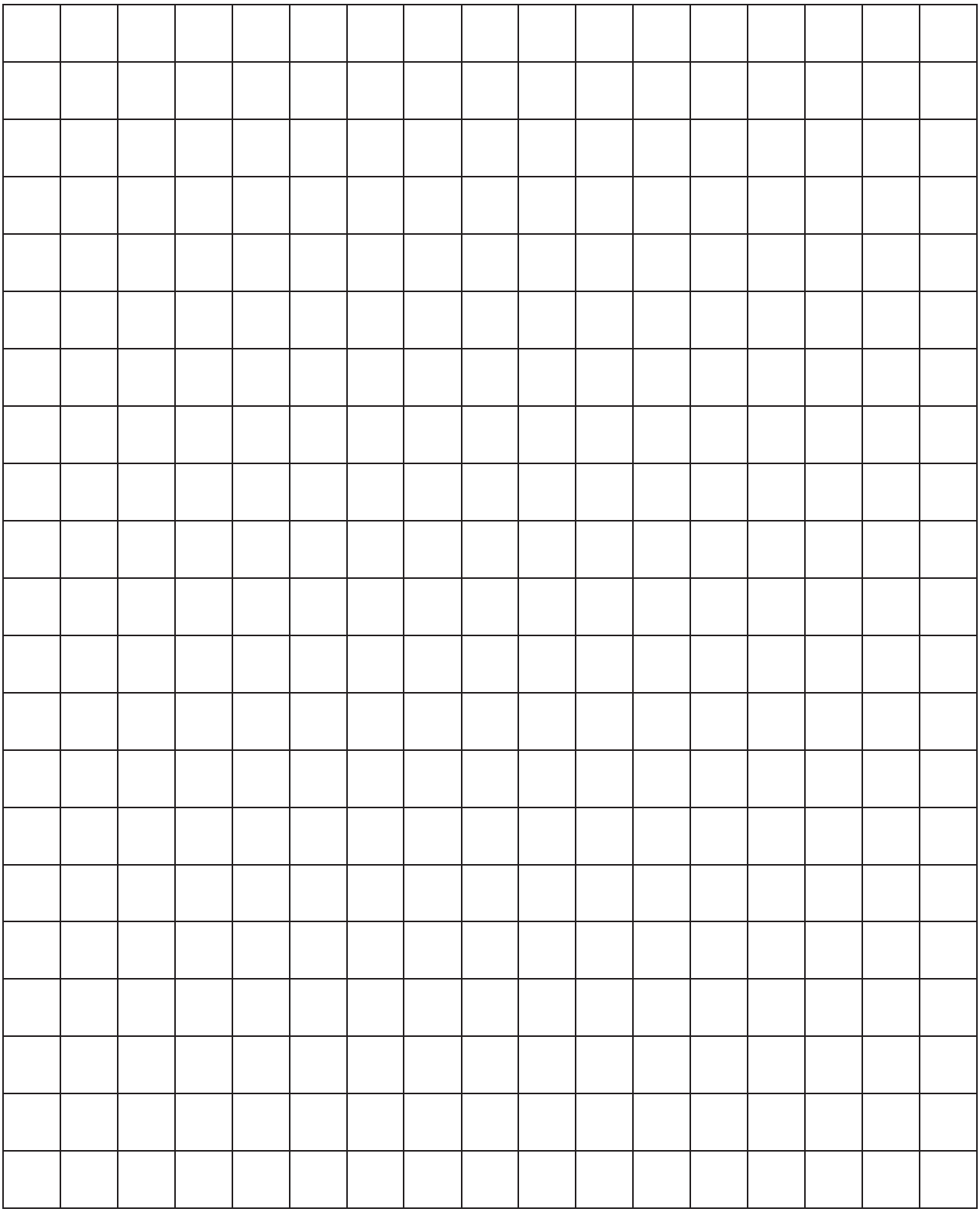
STUDENTS DO: Participate in a **Gallery Walk**. Give friends compliments and ask them questions about the portraits.

TEACHER SAY: **You should all feel proud of all the work you have done over the course of the year. You really grew as mathematicians. The next step is your own—to find ways to practice your skills to be ready for Primary 4. Well done. Give yourself a big hug.**

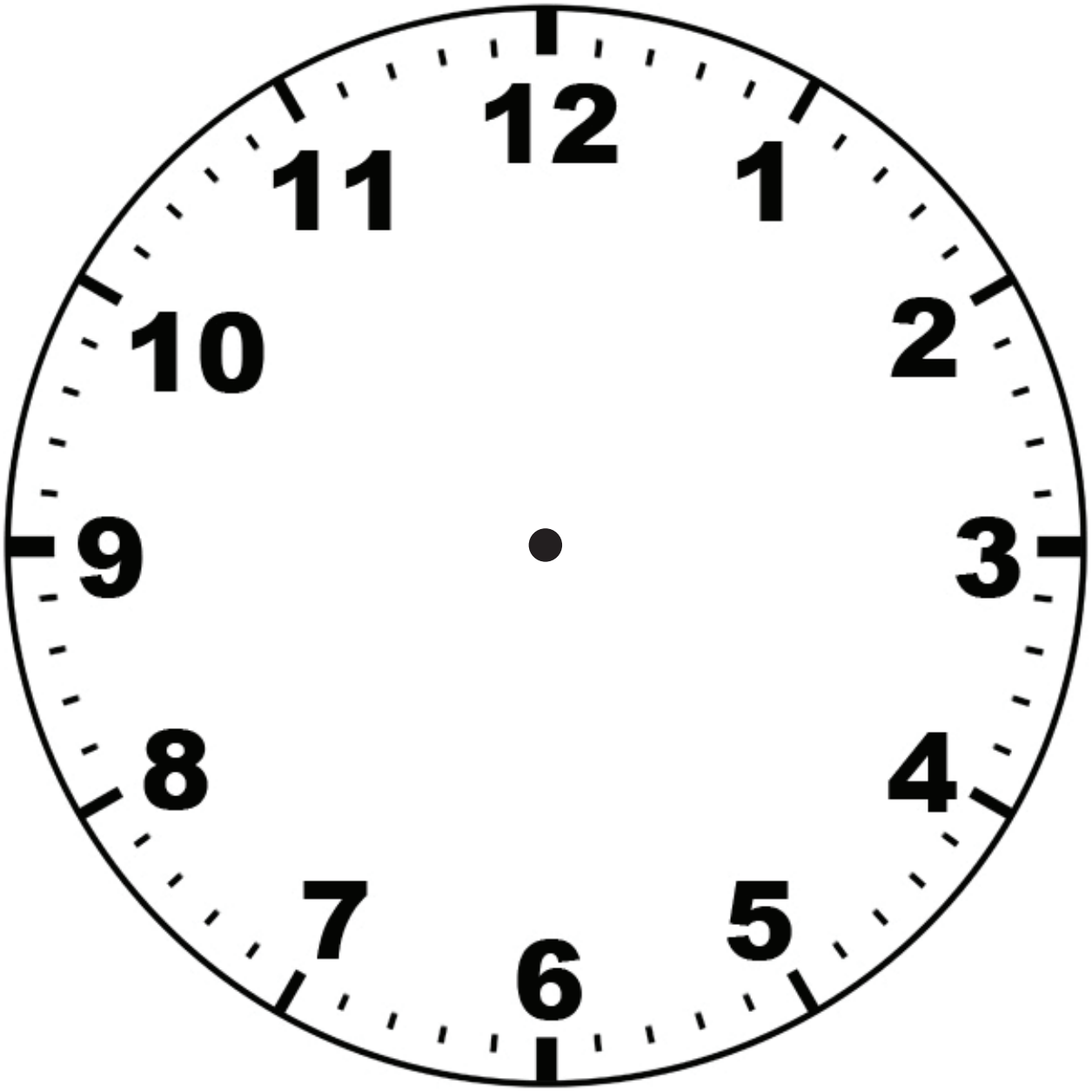
STUDENTS DO: Give themselves a hug to congratulate themselves on all of the hard work.

Student Resources

1-Centimeter Grid



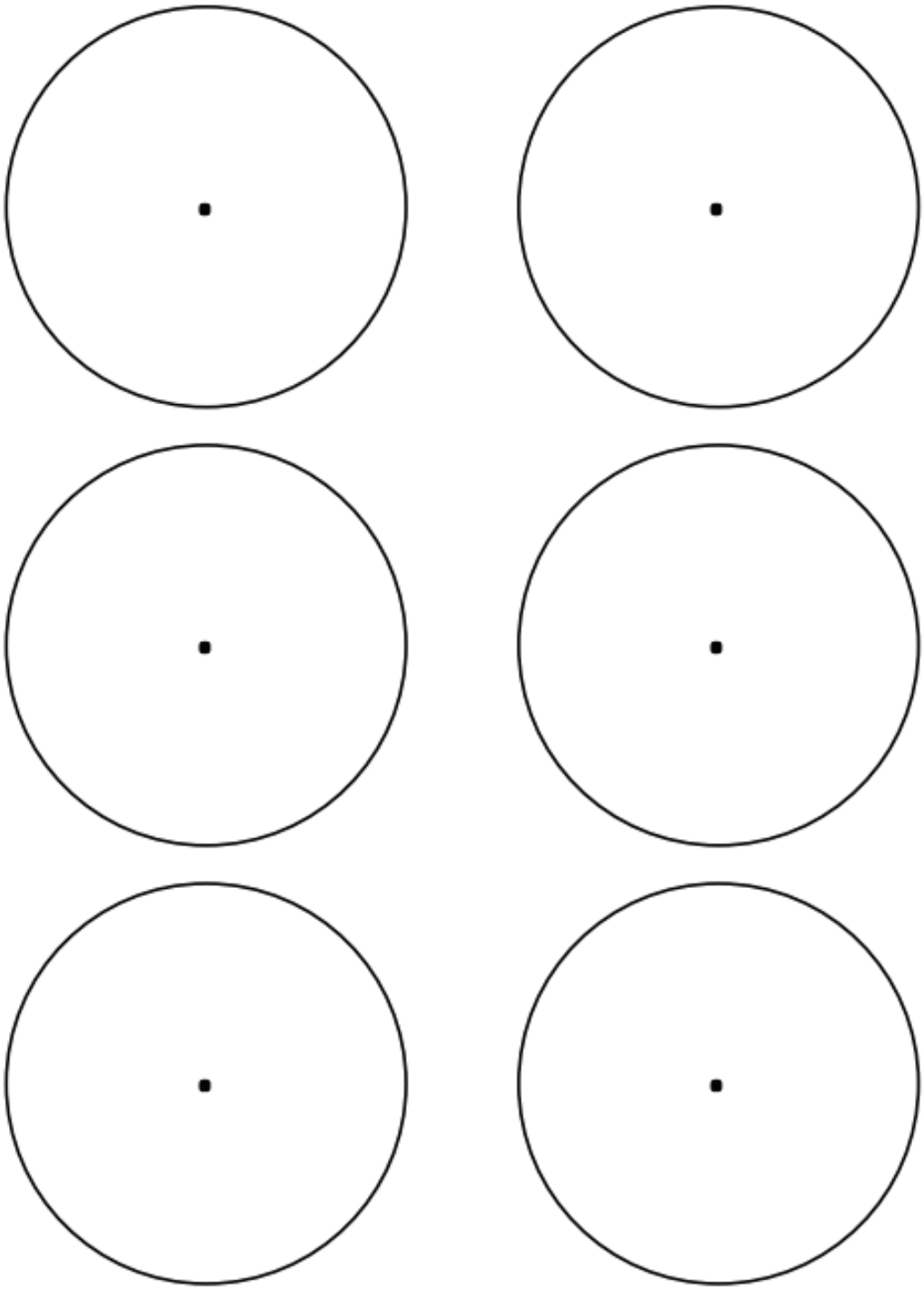
Analog Clock Face – Large



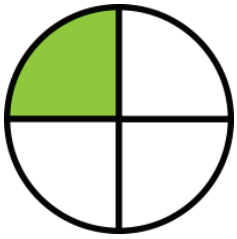
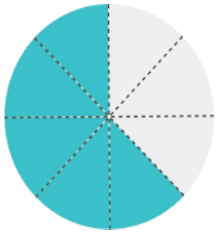
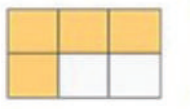
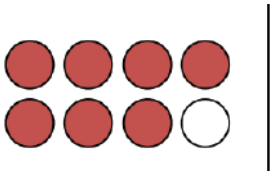
HOUR

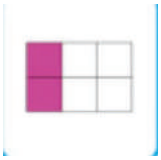
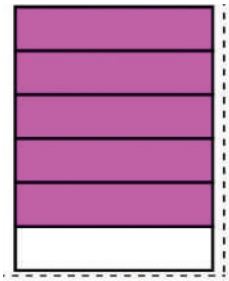
MINUTE

Circle Template Blackline Master



Fraction Game Cards

A. What fraction is shaded? 	**B.** What fraction is NOT shaded? 	**C.** What fraction is shaded? 
D. What fraction is shaded? 	**E.** What fraction is shaded? 	**F.** What fraction is shaded? 

G. What fraction is NOT shaded? 	**H.** What fraction is shaded? 	**I.** What fraction is NOT shaded? 
J. What fraction is shaded? 	**K.** Draw at least one model of this fraction. 2/3	**L.** Draw at least one model of this fraction. 4/6

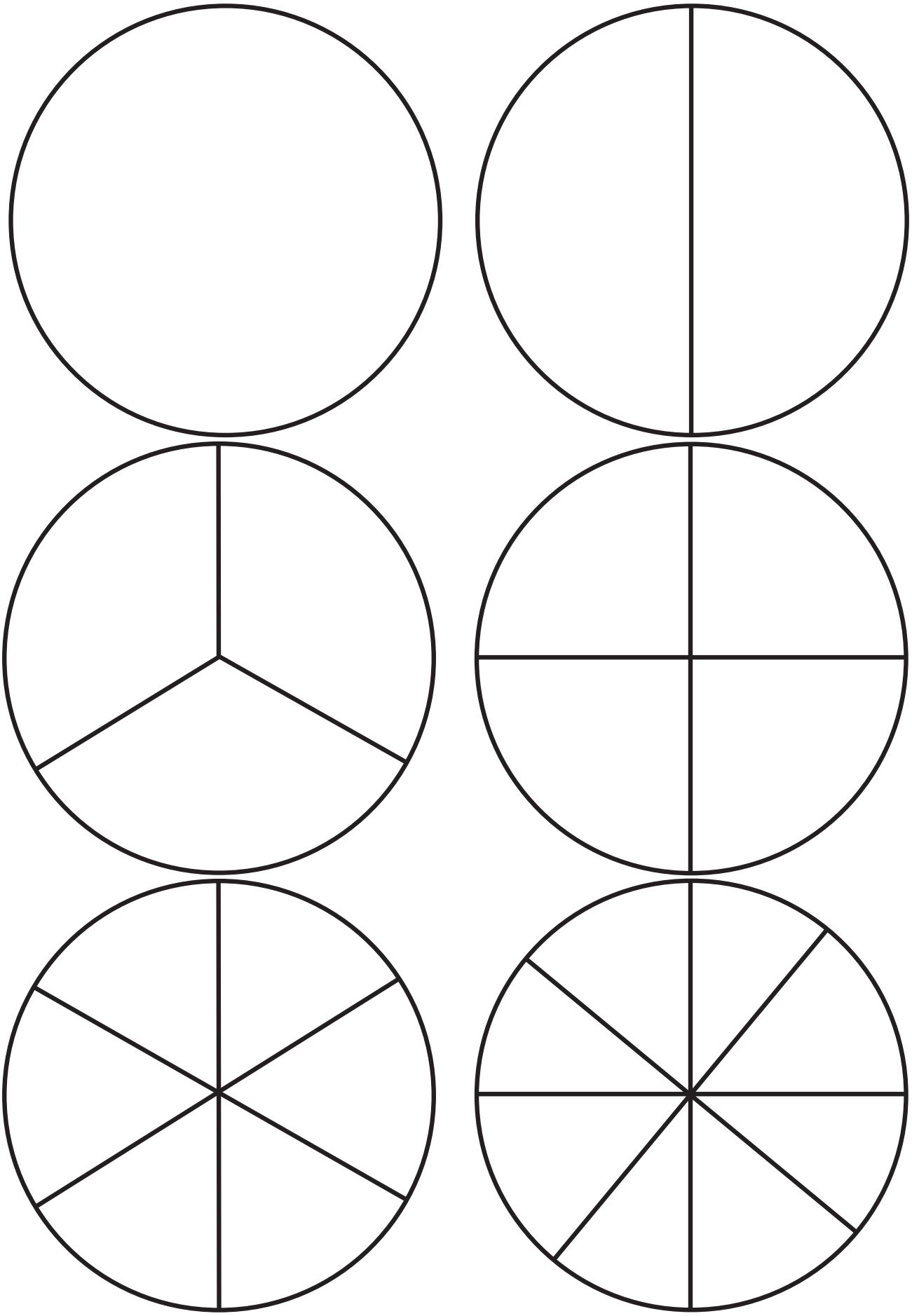
M. Draw at least one model of this fraction. 2/8	**N.** Draw at least one model of this fraction. 5/8	**O.** Draw at least one model of this fraction. 3/6
P. Draw at least one model of this fraction. 3/4	**Q.** Draw at least one model of this fraction. 2/6	**R.** Draw at least one model of this fraction. 3/12

S. Draw at least one model of this fraction. 7/8	**T.** Draw at least one model of this fraction. 5/6	

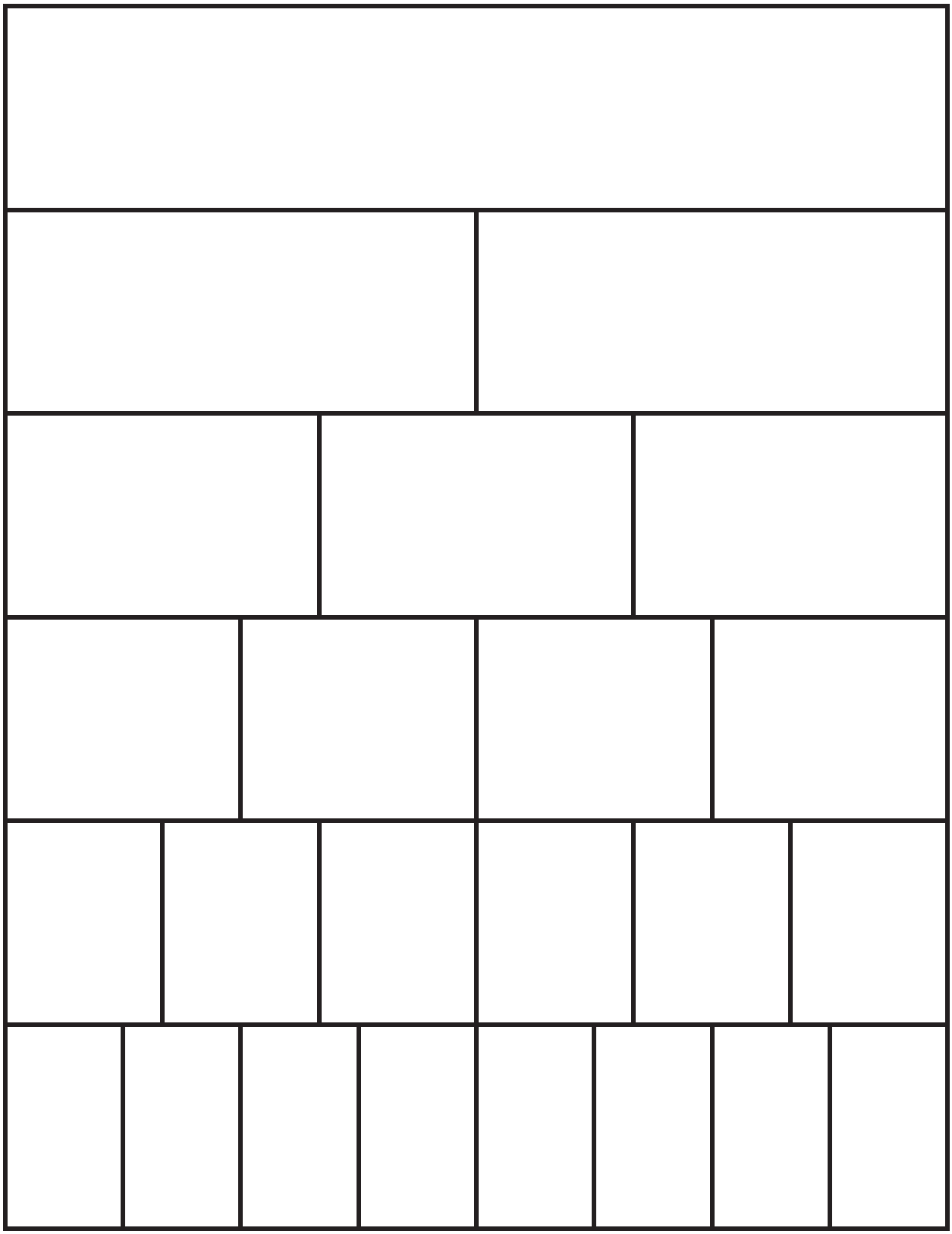
Fraction Matching Cards (4 sets)

4/12	1/3	3/6	6/12
3/4	9/12	1/2	4/8
8/12	4/6	2/12	10/12
4/12	1/3	3/6	6/12
3/4	9/12	1/2	4/8
8/12	4/6	2/12	10/12
4/12	1/3	3/6	6/12
3/4	9/12	1/2	4/8
8/12	4/6	2/12	10/12
4/12	1/3	3/6	6/12
3/4	9/12	1/2	4/8
8/12	4/6	2/12	10/12

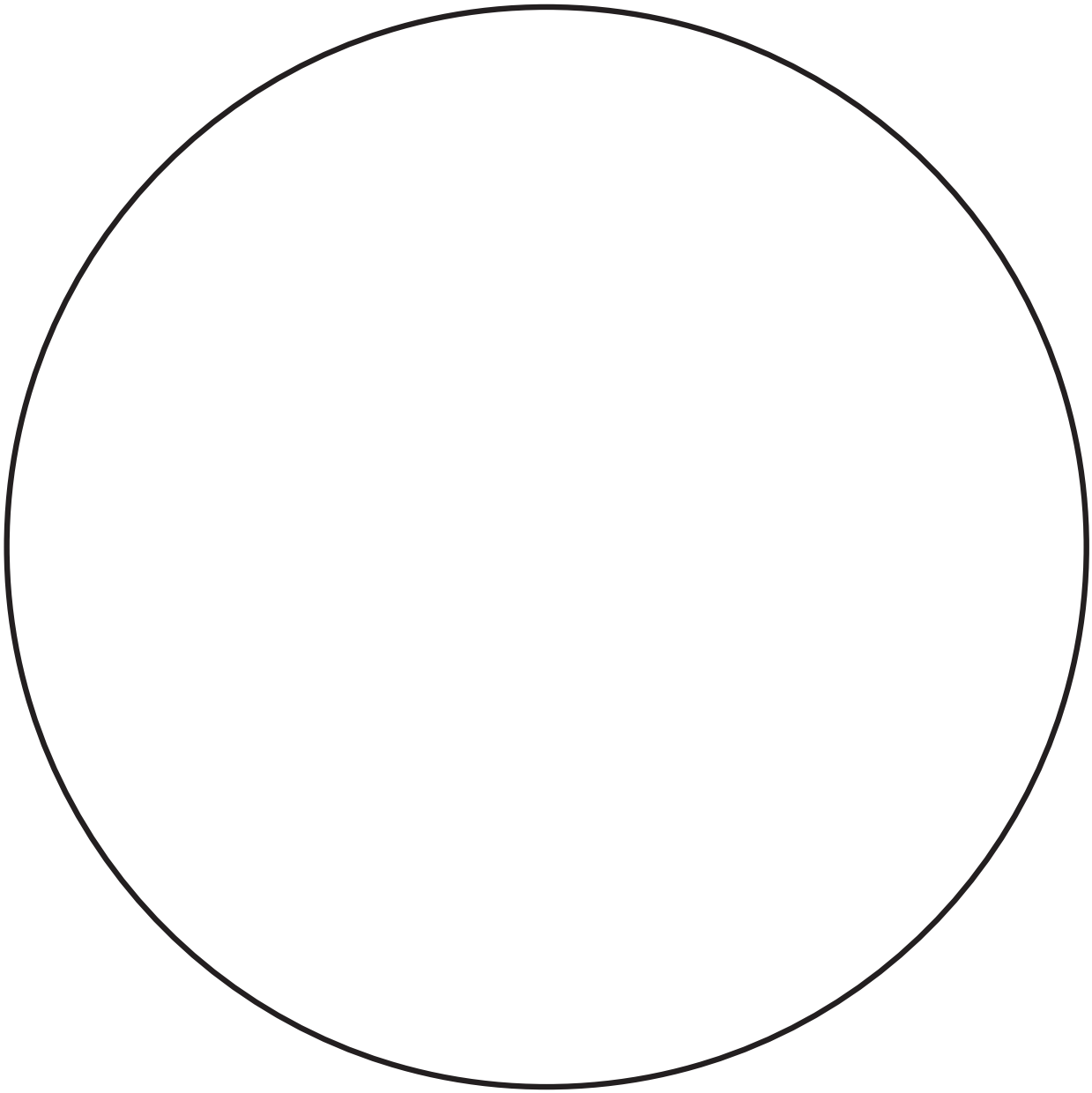
Fraction Model – Student Circles

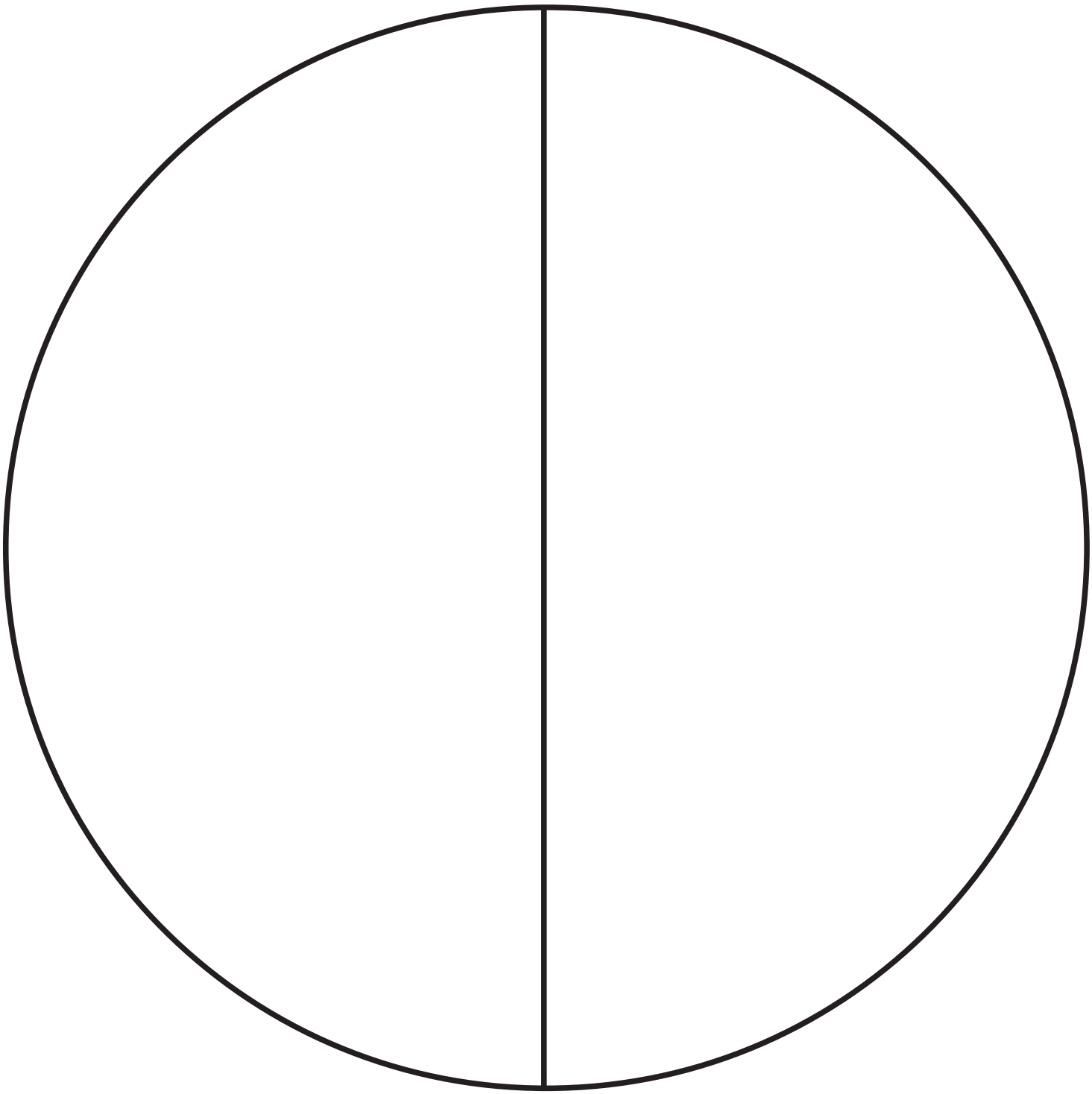


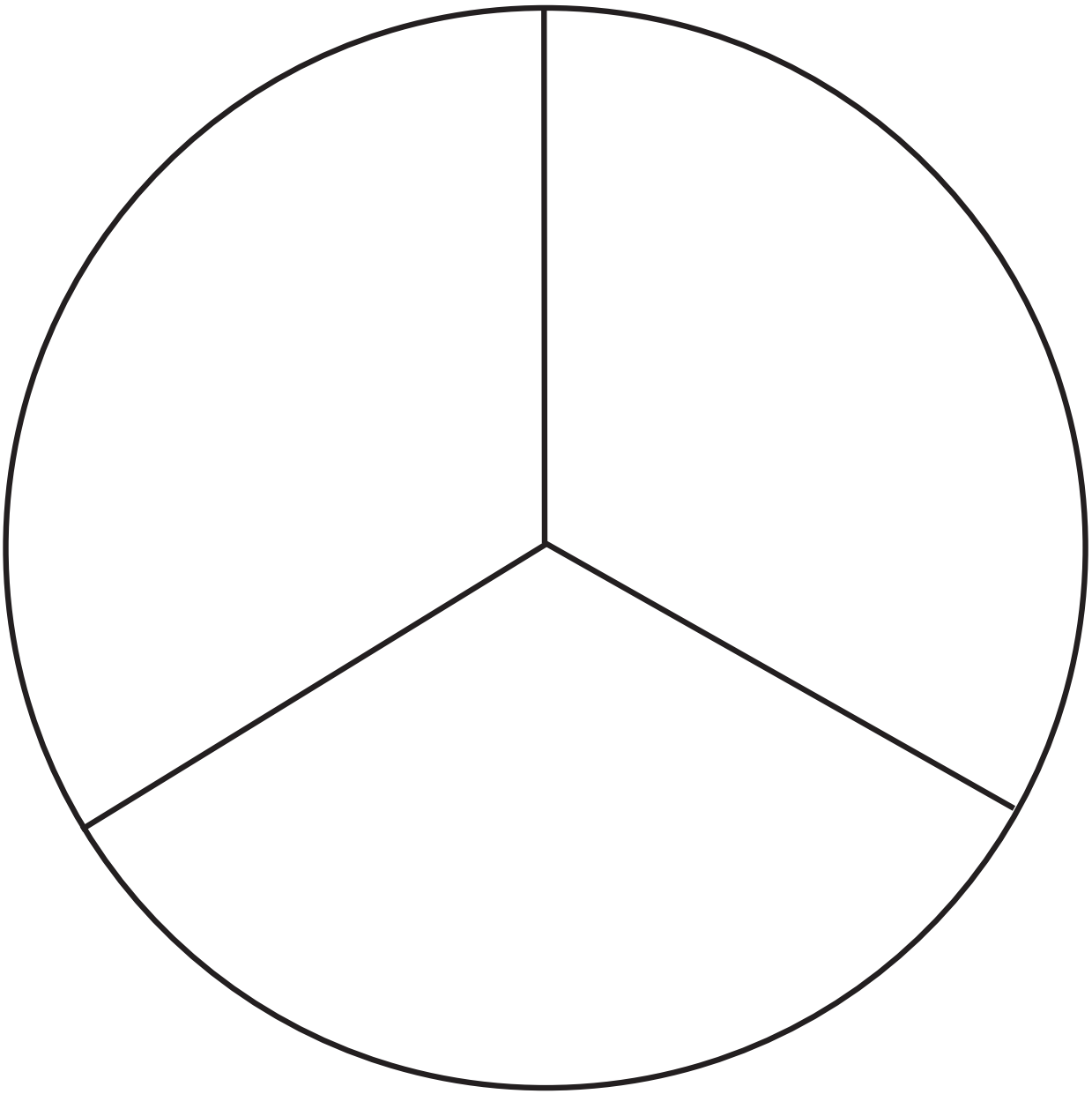
Fraction Model – Student Strips

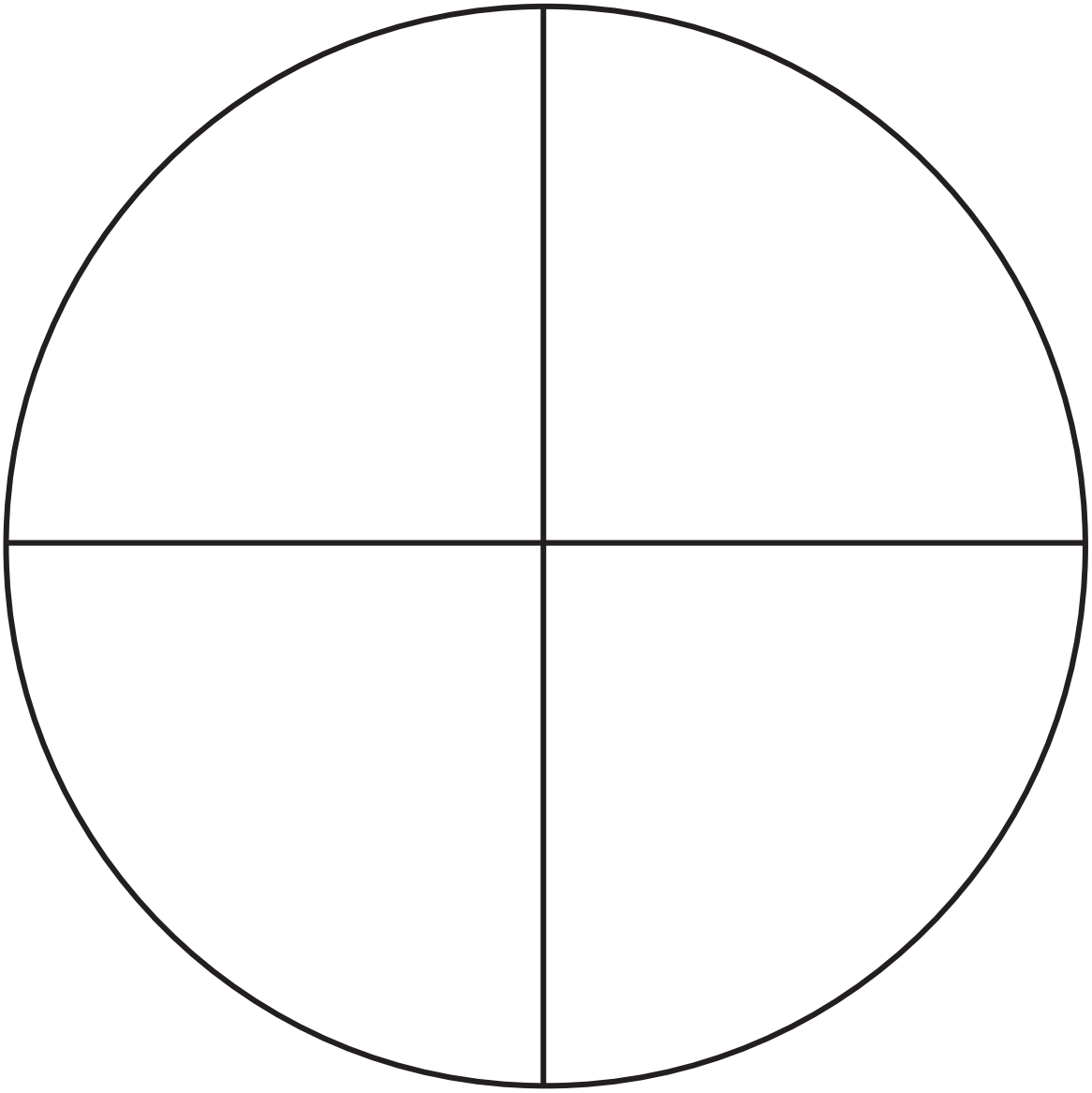


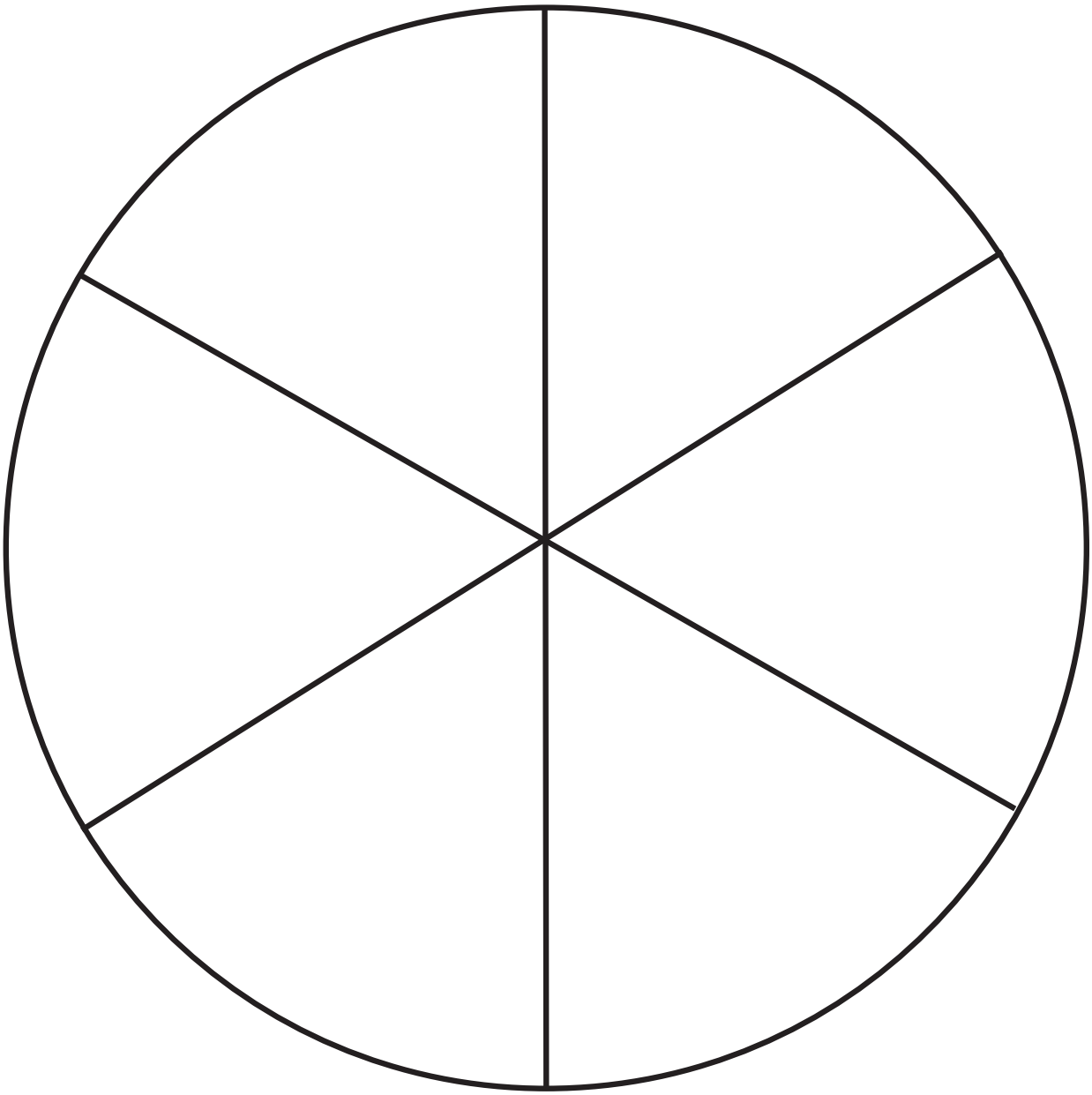
Fraction Model – Teacher Circles

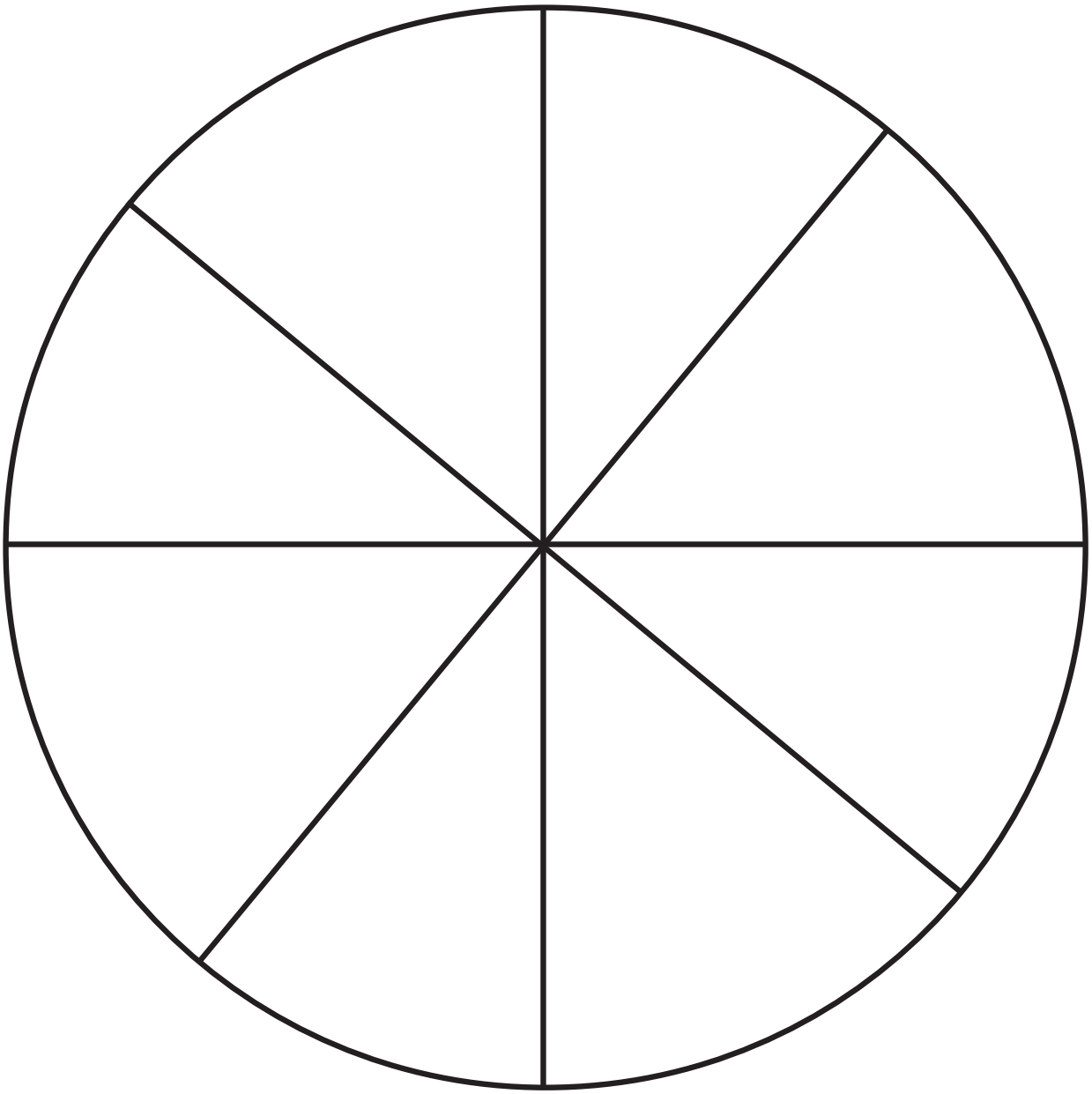




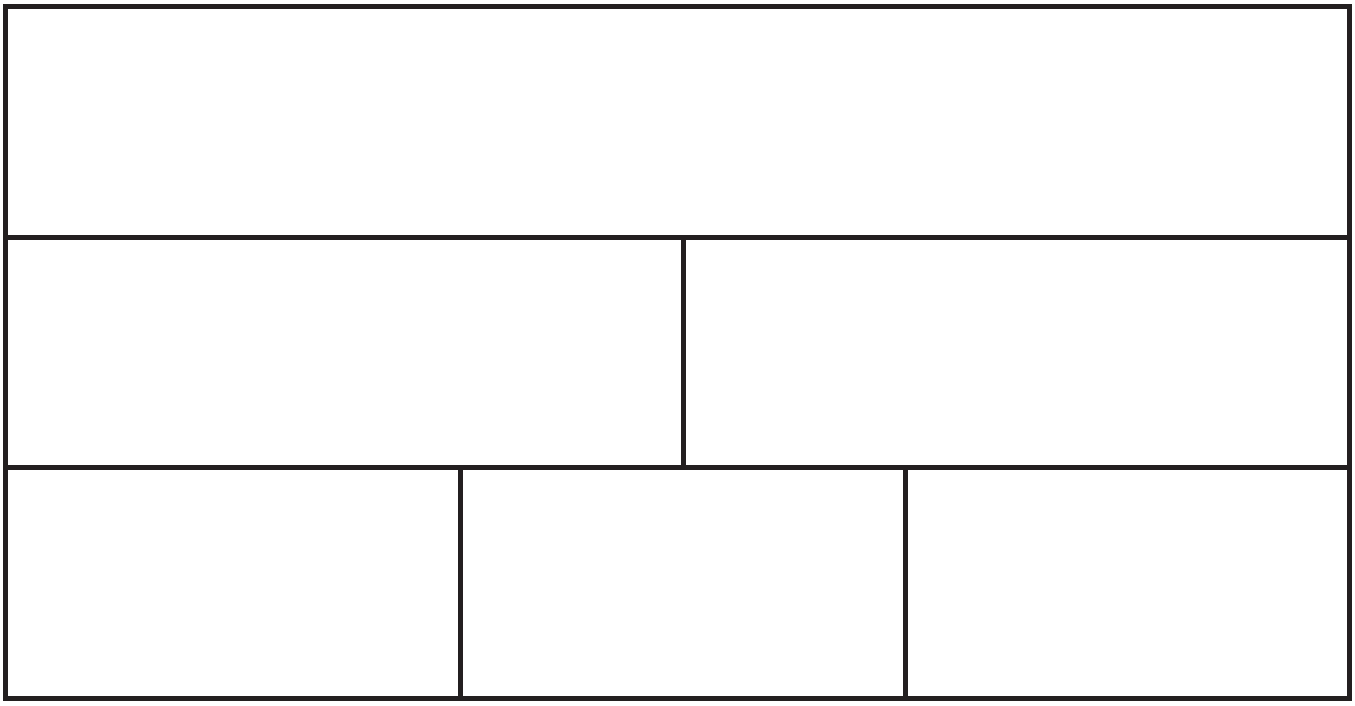


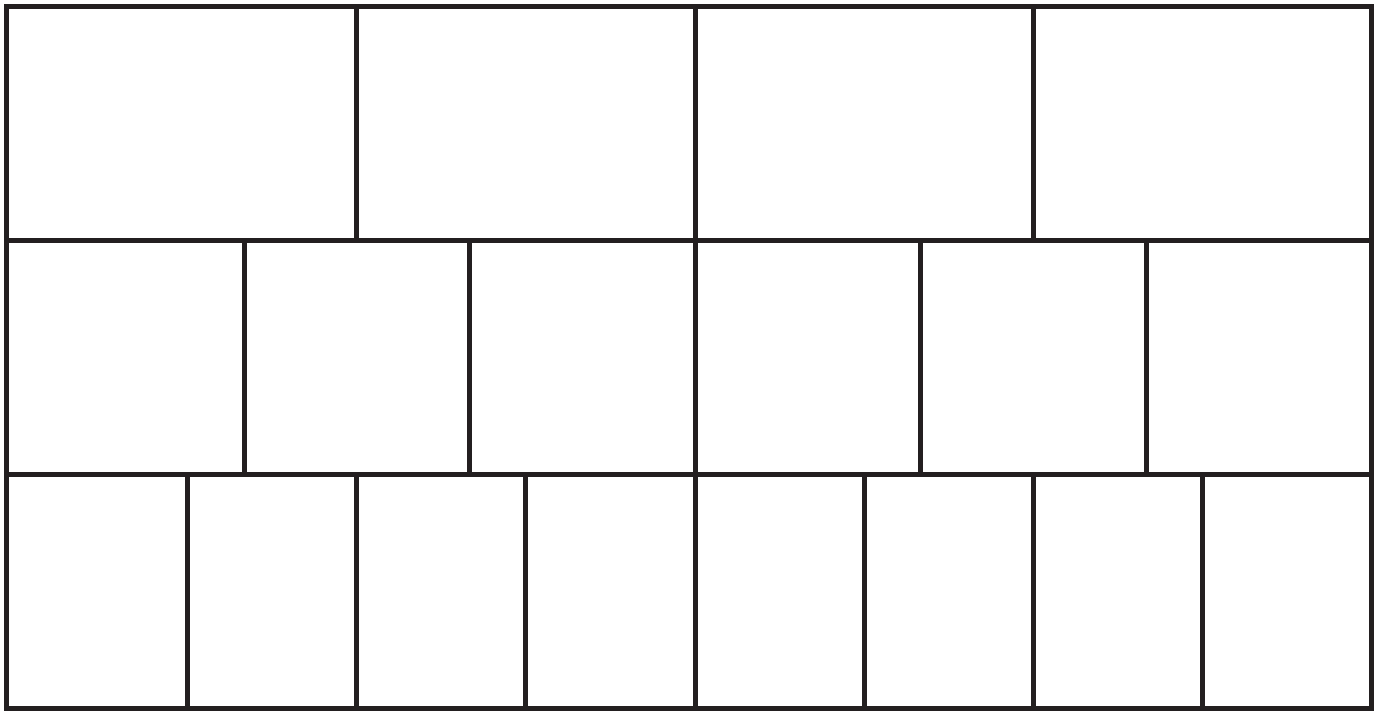




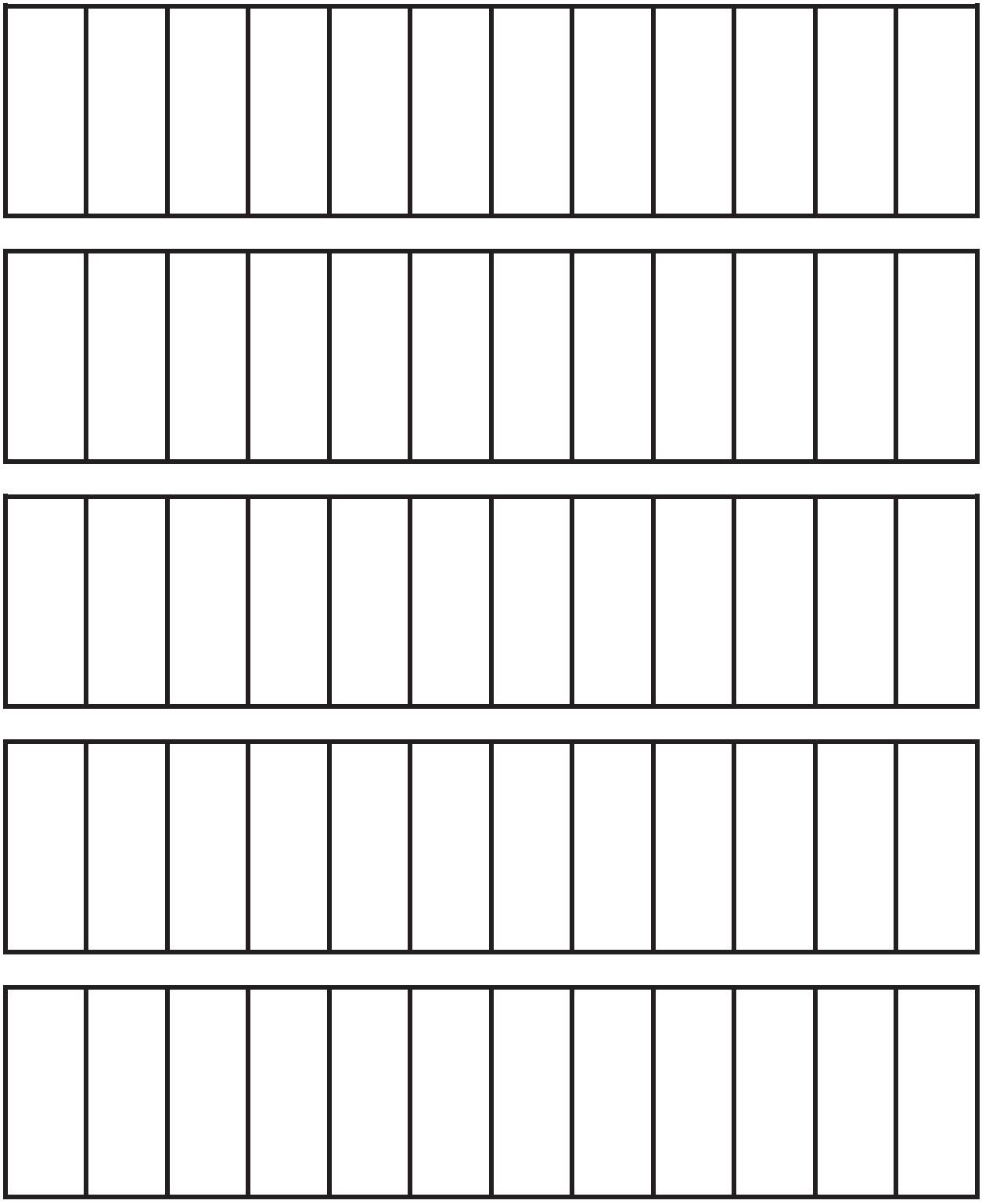


Fraction Model – Teacher Strips

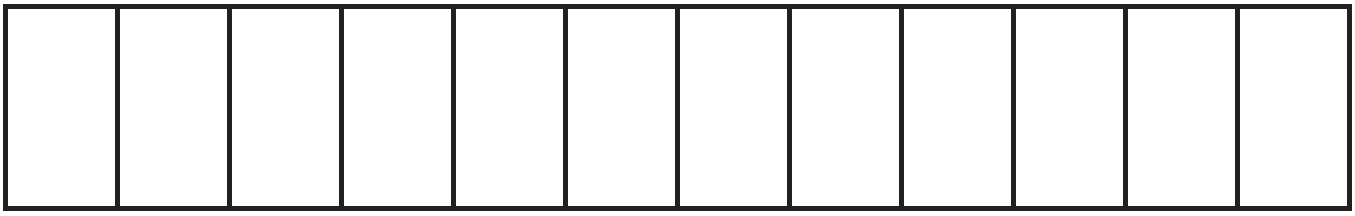




12^{ths} Fraction Model – Student Strips



12^{ths} Fraction Model – Teacher Strips



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